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Inquiries from the media and the public about the work of the Committee should be made to Barry Karr, Executive Director, CSI, P.O. Box 703, Amherst, NY 14226-0703. Tel.:716-636-1425. Fax: 716-636-1733. Email: bkarr@centerforinquiry.org.

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[FROM THE EDITOR

Environmental Excesses, UFO Enthusiasms

We all want to protect our planet: our land, water, air—all life itself. Environmentalists bring passion and dedication to that cause, to enormous positive effect. But there is another aspect. As David Mountain writes in our cover article, "Environmentalism has been shaped by a range of fringe beliefs that have nurtured a tradition of unscientific thinking about the natural world." He writes from a clearly sympathetic viewpoint about the causes while also urging environmentalism to renounce "its long dalliance with the fringe."

In a related article, "Ten Years of Fukushima Disinformation," Amardeo Sarma and Anna Veronika Wendland report on the many misperceptions about the events ten years ago when the fourth largest earthquake in recorded history struck the coast of Japan. The resulting tsunami wreaked the havoc we all watched with horror on television. That in turn triggered the disaster at the Fukushima nuclear power plant. Most of the deaths and destruction were due to the earthquake and tsunami, but anti-nuclear activists have been successful in painting it all as a "nuclear disaster." That has caused grave consequences: to mention just one, Germany announced days later it would shut down its entire nuclear power program. The authors examine a variety of myths about the three-part disaster and contrast them with the facts.

* * *

Are we returning to normalcy? The worst of the pandemic (at least in the West) seems over. We are being vaccinated at high rates. The political chaos in the United States has ebbed. So now we can all get back to our normal concerns, right? Mainstream media can concentrate on other serious issues they've been neglecting. Like what? UFOs, of course. Yes, UFOs are back in the news, now relabeled UAPs (unidentified aerial phenomena). *The New Yorker*—our favorite quality magazine of the establishment—carried a fifteen-page (!) article in its May 10 issue titled "The U.F.O. Papers." It was—how should we say it?—highly imperfect. Some of our scientist colleagues called it "awful." The article was clearly stimulated by a 2017 *New York Times* article; it covered the same ground and interviewed the same sources. Both were short on skepticism and naive about the human dynamics of UFO beliefs. The *New Yorker* article in turn stimulated widespread media coverage in mid-May, including a CBS *60 Minutes* report that was better than most (because it didn't trot out the usual UFO-promoter people). The five Navy videos in these stories may seem puzzling, but our colleague Mick West has provided plausible earthly explanations for all of them. Coverage in next issue.

Science-minded skeptics hardly need be reminded of the notorious history of these enthusiasms. Here are a few points I wish the media would remember: One, stop conflating sightings of *something in the sky* with extraterrestrials. A UFO (or UAP) does not mean "aliens." That's a leap of illogic of galactic proportions. Two, there are always going to be some unresolved sightings. Three, there are always going to be people among the sprawling defense agencies who have to take them seriously … and others there and in politics who tend to be UFO believers and promoters. In the meantime, by sometime in June we are promised an official new government report on the topic. I'm sure that will totally resolve the issue once and for all. And if you believe that …

—Kendrick Frazier

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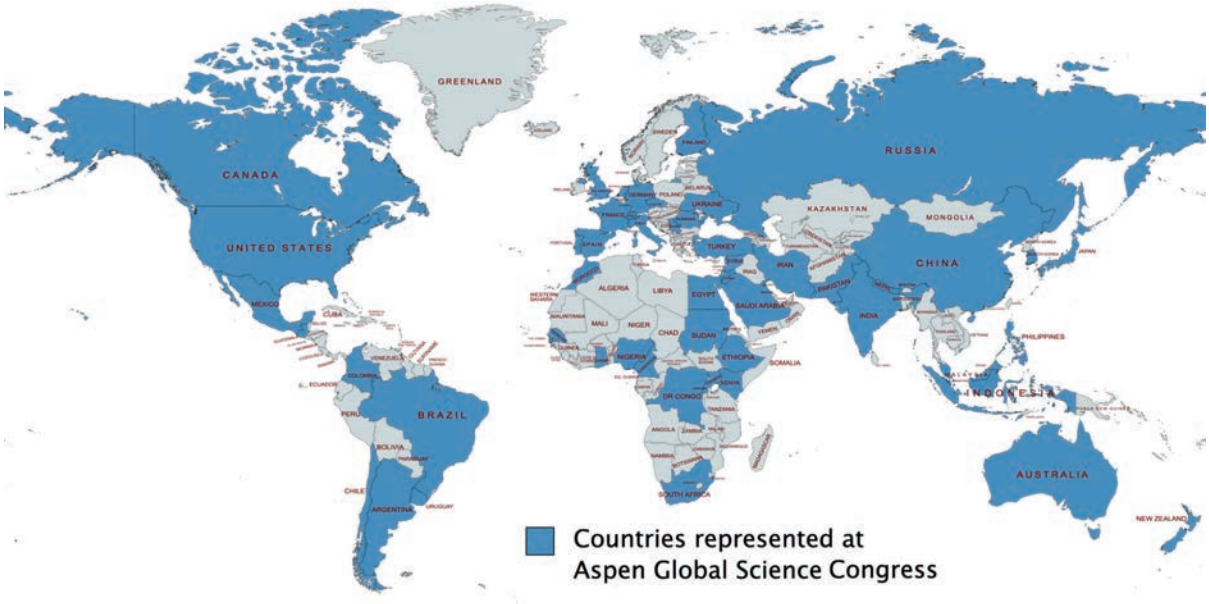
Aspen Global Congress on Scientific Thinking and Action Brings Science and Reason to the Fore

Stuart Vyse



The Aspen Institute Science & Society Program (based in New York City) and the Instituto Questão de Ciência (Question of Science Institute, based in São Paulo, Brazil) cosponsored the first Global Congress on Scientific Thinking and Action March 17–20, 2021. It was originally planned to take place in Rome but was conducted over Zoom due to the pandemic. One hundred scientists, scholars, journalists, and communicators from fifty-five countries gathered to discuss some of the most challenging science policy issues facing humanity today.

The six primary sessions, which were recorded and are available on the Aspen Institute's YouTube channel, were on topics relevant to skeptical inquiry: Overcoming Science Denialism; Science Literacy and Popularization: Understanding How Science Works; Risks and Dangers of Alternative Medicine; Dousing the Fires of Climate Change Denial; Defeating Vaccine Hesitancy through Communication; and Food Biotechnology for a Sustainable Future. Each of these sessions was conducted as a panel of five experts in conversation with each other.

Here are a few highlights from the sessions:

Session I: *Science Denialism*: Philosopher Lee McIntyre (Boston University) discussed his conversations with flat-earth believers, the basis of his forthcoming book *How to Talk to a Science Denier.* He stressed the importance of face-to-face conversations and gaining the trust of the people you are trying to convince.

Session II: *Science Literacy and Popularization*: Professor Masataka Watanabe (Tohoku University) described how manga (Japanese comics and graphic novels) are increasingly being used in science education due to their wide appeal with young people in Japan. In addition, Stuart Firestein, chair of the Department of Biological Sciences at Columbia University, highlighted the public's difficulty understanding uncertainty and suggested that scientists must do a better job of communicating the nature and meaning of uncertainty.

Session III: *Alternative Medicine*: Narendra Nayak, president of the Federation of Indian Rationalist Associations, talked about the wide use of alternative medicines, including homeopathy, in India and said that various alternative treatments are often claimed to be Indian in origin. In addition, the relatively low reported death rate from COVID-19 in India—which was true at the time of the conference but much less so as the magazine goes to press—was in part falsely attributed to the use of homeopathic medicines as preventative. When asked what should be done about the use of alternative medicines in India, he said flatly: "They should be banned."

Edzard Ernst, widely considered the foremost expert on alternative medi-

The organizers of the first Global Congress on Scientific Thinking and Action: Aaron Mertz, director, Science and Society Program, The Aspen Institute, and Natália Pasternak, founder and director of the Question of Science Institute.

cine, described how many universities are developing programs in "integrative medicine," in part because of large donations that are available to fund them. Asked what he thought were the biggest problem areas for alternative medicine worldwide, he named homeopathy and chiropractic medicine.

Session IV: *Climate Change Denial*: John Cook of Monash University (who spoke at Skeptical Inquirer Presents on April 1) discussed his research showing that an effective way to confront misinformation about climate change is to identify the logical fallacies used to support it—for example, pointing out that pitting the economy against the environment represents a false dichotomy.

Lina Yassin, a climate activist in Sudan, discussed the difficulties of working with an authoritarian government that is focused only on economic issues. She has devoted much of her efforts to educating and motivating young people, but at the moment, COVID-19 is an overshadowing issue in Sudan. She also stressed the need to use stories and concrete examples to communicate the importance of climate change; for example, creating a narrative about a family and flood is likely to be a more effective strategy than discussing more abstract arguments.

Session V: *Vaccine Hesitancy*: Fara Ndiaye, deputy executive director of Speak Up Africa, based in Dakar, Senegal, emphasized the need for community ownership of health messaging. She suggested that African scientists should be given greater opportunities to speak directly to the public so that public health messages are more often seen as coming from in-country rather than from abroad. Vaccines coming from abroad are often distrusted, so community grounding of health policies is very important.

Session VI: *Food Biotechnology*: Kenya-based Margaret Karembu, director of the AfriCenter, International Service for the Acquisition of Agri-biotech Applications, indicated seven countries, including Kenya, have approved use of crops with genetically modified organisms (GMOs). Nigeria has approved the use of an insect-resistant cowpea. Echoing the comments by Ndiaye in the previous session, she said that the voices of African scientists have been overshadowed by those of human rights activists opposed to GMOs. She urged that it is important not to over-claim what GMOs can do and choose the right communication platform. In Africa, WhatsApp is a particularly valuable social media tool.

After each session presentation, the speakers shuffled off into individual Zoom rooms with randomly assembled groups of the larger Congress participants. During this time, participants, including me, discussed some of the issues raised in presentations. The format made it possible for people from all over the world to meet and discuss important science policy issues in a friendly environment.

The organizers of the event were quite pleased with the outcome. "Our main goal for this first event was to bring scientists, science advocates, and science communicators together, and in doing so, raise awareness to the fact that we all face common global issues that need to be communicated to different publics, cultures, and backgrounds," said co-organizer Natalia Pasternak. "I hope that in this first event, we learned from one another's challenges and perspectives."

Plans are underway to have similar conferences on an annual or biannual basis, as well as more frequent small group meetings. In addition, Aaron Mertz (director, Science and Society Program, The Aspen Institute) and Pasternak indicated that a report was in progress, outlining the major findings and goals for the future.

It is clear the organizers are not interested in a merely academic enterprise. Their hopes for the Aspen Institute's Global Congress for Scientific Thinking and Action place great emphasis on the activism part of their mission. "A key next step will be to find ways for us to have a global voice, through the future issuing of reports or petitions, when we see science mishandled transnationally," Mertz said. It seems clear that Mertz and Pasternak have launched an ambitious project that has the potential to be a leader in the effort to promote science and reason around the globe.

Stuart Vyse is a contributing editor and columnist for Skeptical Inquirer and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a CSI fellow.

Social Media Abduction Rumors Go Viral

Benjamin Radford

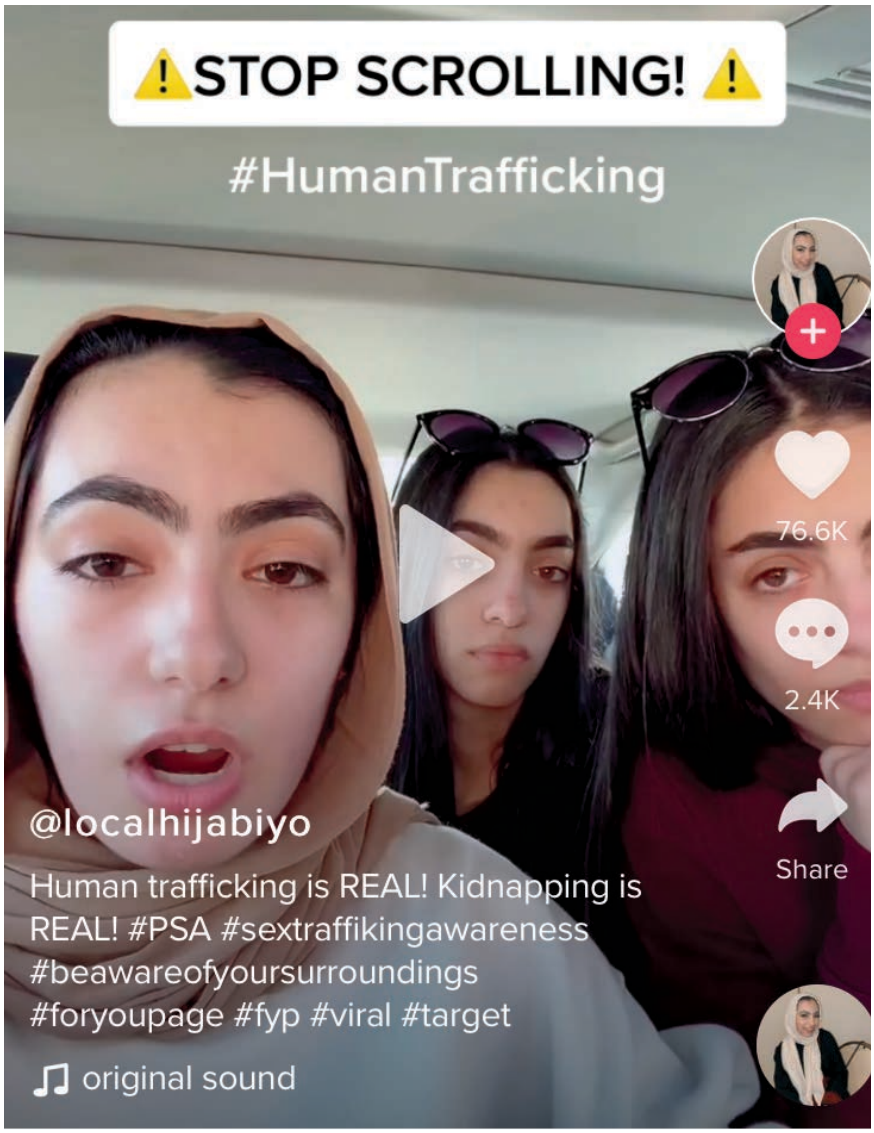
In April 2021, dozens of viral videos circulated on the social media platform TikTok, shared by young women offering dire warnings about abductions at Target stores. The videos, typically hashtagged with phrases such as #sextraffickingawareness, were seen tens of millions of times.

"If you're seeing this—stop scrolling, especially if you're a female!" one video began. The woman said that she and her female friends were shopping at Target when a man approached them asking if they were models. They got suspicious and brushed him off, but he kept watching them and "hid" in the onsite Starbucks café, at which point she asked store security to safely escort them to their cars. The story ends with a warning, "So ladies, please be careful. It happens way more often than you think."

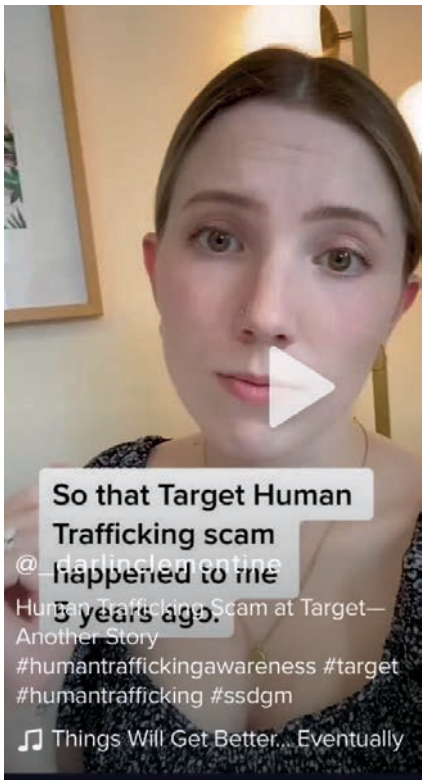
Another woman seemed nearly gleeful as she described "Almost potentially being sex trafficked at Target!" and states very matter of factly that "Apparently Target is now a sex trafficking hub." She described an older woman and her daughter who approached her in the store, then started talking to each other (presumably about her), and then followed her around the store and then out to her car.

A third related an incident that she claimed had happened five years earlier, in which she was approached by a woman who gave her a business card she felt was suspicious and suggested they meet for coffee. Becoming alarmed, she said she ran into a dressing room and "Googled [the information on the card]—and it wasn't anywhere! Not a real thing. So if this happens, call security and have them walk you to your car."

While fear spreads on social media, authorities have found no evidence that Target stores are a hub for any criminal rings. In an article on the topic in *Rolling Stone*, E.J. Dickson quotes the executive director of an organization fighting sex trafficking, Jean Bruggeman, as saying, "I have never heard of a case of anyone being abducted from Target in my twenty years in this field." Of course with nearly 2,000 stores nationwide, by random chance some assault or attempted abduction may happen at a store (or more likely in a shared parking lot) at some point, but there's no reason to think the stories shared on social media are true as described.



The rumors are in some ways similar to child abduction rumors that circulated in July 2020 when online furnishings retailer Wayfair was accused in social media posts of trafficking children through listings of products with inflated prices and common names. The bizarre and baseless idea was that seemingly overpriced listings for pillows


So that Target Human Trafficking scam happened to me 3 years ago.
Human Trafficking Scam at Target—Another Story
#humantraffickingawareness #target #humantrafficking #ssdgm
Things Will Get Better... Eventually

and cabinets were somehow evidence of a child trafficking scheme. However, the Wayfair rumors were more of a factual claim, and the Target stories were presented as what folklorists call memorates, or first-person accounts of allegedly true events—along the lines of an urban legend. Target is only the latest of many settings for abduction rumors; parking lots have long been targeted as well (for more see my News and Comment "Zip Tie Abduction Rumors Spread, Lead to Panic and Arrests" in the November/December 2020 SI).

So if these stories almost certainly didn't happen, why are people saying they did? The motivations are mixed. Some of the women may sincerely have experienced some concerning interaction at a Target store. Others may have reframed previous ambiguous experiences in a new and sinister light, encouraged and influenced—as well as psychologically primed—by other similar accounts on social media. Still others may be doing it as part of a copycat or bandwagon effect, where they see others getting attention and decide to join in with their own story (true or not). Perhaps the biggest factor is the most obvious and the one that assures that urban legends will always be repeated: the incentive to tell a sensational and dramatic story. These viral videos garner attention and sympathy, but even more important, they are rewarded in the ultimate social media currency: Likes, Shares, and Followers.

It's a relatively safe way to get attention; the stories are typically generic, with few identifying characters (though occasionally a specific Target location is mentioned). There is little or no follow-up or investigation. Police are rarely mentioned partly because the events described didn't happen: the would-be victims were *almost* abducted, *nearly* captured. Instead they were safely escorted to their vehicles by store security (though you'd think that protocol would require a call to police if anyone involved genuinely believed an abduction was happening) and rescued.

Because no police report is filed, there's little danger of anyone being accused of filing a false report. There are, however, other concerns. One is that these rumors create needless fear and anxiety, especially among women; there are enough genuine threats that people don't need to manufacture them. These false rumors also distract from real dangers. Wealthy, mostly white women posting on social media are in far less danger of being abducted and trafficked than people of color, runaways, addicts, and others. People are at far greater risk of being abducted or assaulted by someone they know than some sinister stranger lurking in the housewares department at Target.

Folklore, and urban legends specifically, reflect society's fears and concerns, both about women's safety and more generally. Interestingly, the threat in these videos is not clearly gendered; in over half of the videos I saw, a woman was identified as the threat—perhaps making it all the more scary for the audience, because it's not a stereotypical creepy male lurker but instead a friendly fellow female hiding sinister motives.

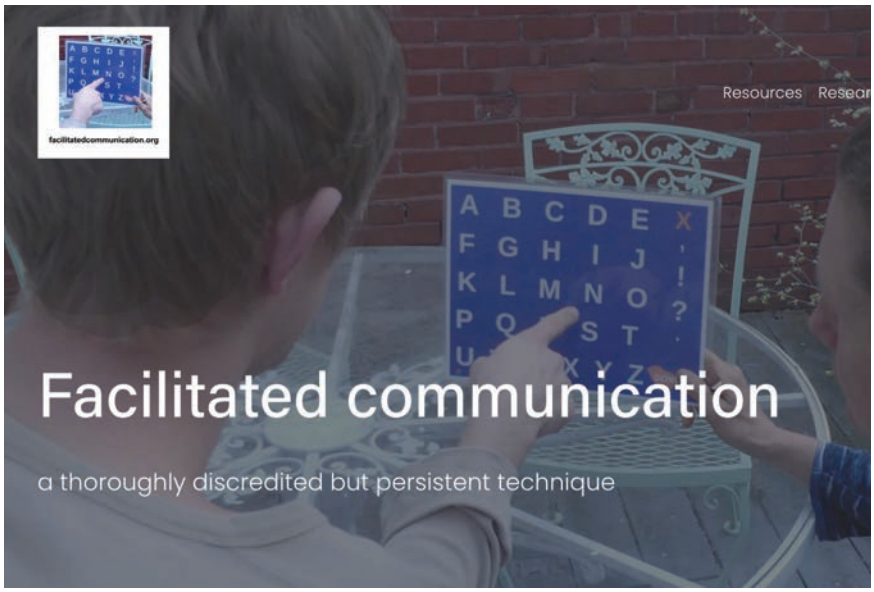
These rumors are given some measure of credibility by prominent, real-life accusations of sex trafficking, for example by New England Patriots football team owner Robert Kraft (dismissed in 2019); Jeffrey Epstein and Ghislaine Maxwell; and Florida Representative Matt Gaetz. And, of course, there's the sex trafficking hysteria fomented by QAnon (see Stephanie Kemmerer's recent articles in this magazine). Taken together and fueled by a latent Stranger Danger panic and the enduring appeal of "scarelore," it's not surprising that these abduction rumors are making the news. As is often the case with these social media scares, people share them not only for entertainment value but out of a sense of altruism. They may in fact be skeptical about the truth of the claims but dutifully share them assuming that it's better to be safe than sorry.

Though most of the rumors don't identify any specific person as being an attempted abductor, it does happen—and there have been many incidents in which false abduction claims have targeted people of color. For example, in December 2020 in Petaluma, California, a prominent social media influencer named Katie Sorensen claimed that a man and woman tried to abduct her two young children at a craft store. Like with the TikTok videos, she took to Instagram to tell her harrowing story and in the process named a Hispanic couple who were Christmas shopping nearby and had no interaction with her. The couple's photos, taken from surveillance footage, circulated on social media, and the couple were contacted by police, who after an investigation determined that Sorensen had falsely accused them (for more on this see "Social Media Maven Mom Falsely Accuses Hispanic Couple of Abduction Attempt" at https://tinyurl.com/55ahx24m). Sorensen was charged with two counts of false reporting in early May. As always, critical thinking and media literacy are the best antidotes to fearmongering.

Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry.

New Anti–Facilitated Communication Website Launched

Stuart Vyse



A group of advocates working to oppose the use of a discredited communication technique used with autistic children have launched www.facilitatedcommunication.org. The site provides information about facilitated communication (FC) and resources for parents, educators, and members of the media. There are links to the available research on FC and its spin-offs, rapid prompting method and spelling to communicate, as well as a collection of the many policy statements opposing the use of FC released by professional organizations such as the American Speech-Hearing-Language Association and the American Psychological Association. Because FC claims to unlock the voices of previously nonspeaking people, it is often the vehicle for miraculous feel-good stories in the media, books, and films (see Benjamin Radford's review of the film *Unspoken* in this issue). As a result, the new site includes a catalog of these media portrayals, complete with skeptical reviews. Importantly, the site is also a repository of cases of serious harm caused by facilitated communication, including many false claims of child abuse and actual instances of sexual assault. Finally, the site also includes a blog where regular authors and guest authors write about new developments in this ongoing problem.

"Our goal is to help educate people about the harms of this pseudoscientific practice, keep people appraised of current developments, and provide resources for individuals who are seeking to better understand the phenomenon," Janyce Boynton, one of the organizers of the website told Skeptical Inquirer. "Many of the contributors—both acknowledged on the website and behind-the-scenes—have been affected personally or professionally by FC and bring rich and diverse perspectives to the effort."

Stuart Vyse is a contributing editor and columnist for Skeptical Inquirer and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a CSI fellow.

Lunacy, Again? Two Flawed Papers on Lunar Effects

Yaël Nazé

Two recent papers on lunar influence were recently published in the journal *Science Advances*. They made some buzz but do not really advance science.

Moon and Sleep

Leandro Casiraghi et al. (2021) asked twenty-five to forty people in each of three Argentine villages (one rural without access to electricity, one semi-rural, and another in an urban area) to record when they went to sleep and when they awoke during two consecutive months. The rural people reported that they went to sleep about twenty-five minutes later (and their sleep was shortened by about the same amount of time) just before the full moon. The effect was smaller—likely insignificant—for urban people. The obvious explanation, which was confirmed by subsequent interviews: people in rural areas stayed awake later when there was more (moon)light.

The authors claimed to have found a similar difference in students from the University of Washington, but details are so scarce that its validity cannot be determined. Indeed, several previous studies have failed to find any difference in sleep duration with lunar phase when using representative samples. Finally contradicting their own results, the

authors postulated gravity, not light, as the cause—but gravitational (tidal) effects would be maximal at both full and new moons, which occur bimonthly, not monthly. They explained the discrepancy by saying only the full moon can be "above" the sleeper and "pull," which is nonsense (remember tidal bulge geometry!).

Moon and Menstruation

The other article, by C. Helfrich-Förster et al. (2021), claims to find a link between menstruation and lunar phases. Its small sample (only twenty-two subjects) was unlikely to have enough statistical power to be meaningful, and in any event the results were actually negative! In ten subjects there was no correlation, and for the others the correlations were only intermittent. Also, there were many woman-to-woman differences (e.g., their evolution with age or the relevant phase—full or new moon). Their data failed to support their conclusion of "high synchrony," and, moreover, the authors' supporting references were cherry-picked to support their hypothesis. In the end, a last claim about the impact of light pollution (used to explain differences with an older, also problematic, "study") is not backed-up.

Finally, that paper ended by saying that the cause for synchronization was gravitation—specifically tides. They propose that humans can sense tidal atmospheric pressure changes or oscillation that electromagnetic fields create by a perturbed magnetotail. In addition to repeating that women are not lunar clocks, is it necessary to say that none of those detection capabilities were ever found?

These studies in *Science Advances* can be disregarded. The moon was once thought to cause madness and many other strange effects. Despite numerous studies over many years, science has found no credible evidence of correlation between lunar phases and human biology.

Acknowledgment

The author thanks Dr. Harriet Hall for her help in shortening this article and her advice on the manuscript.

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Yaël Nazé is a FNRS Senior Research Associate at the University of Liège, Belgium. She studies stars, teaches critical reasoning, and does outreach in various ways.

American Philosophical Society Honors Memory Expert Loftus

The American Philosophical Society has awarded its 2020 Patrick Suppes Prize in Psychology to noted psychologist and CSI Fellow Elizabeth Loftus "in recognition of her demonstrations that memories are generally altered, false memories can be implanted, and the changes in law and therapy this knowledge has caused."

"Of all the world's cognitive scientists," the Society wrote in its honor, "Elizabeth Loftus has carried out research that has had the strongest and most important impact upon society."

Loftus is Distinguished Professor and member of Psychological Science, Criminology Law and Society, Cognitive Science, and the School of Law at the University of California at Irvine.

"Her experiments reveal how memories can be changed by things that we experience, that we rehearse after the fact, and that we are told," the extended citation from the Society says.

> She is the world's authority on the field known as false memory. She has shown how suggestions after a memory has formed can alter that memory, research that has produced growing changes in the way that police interrogations are carried out, so that initially uncertain memories are not transformed into certain ones. Even more startling, she has shown how strong, vivid and compelling memories can be formed for personal experiences that never happened.

Other research by Loftus has demonstrated uncertainties and ambiguities inherent in many instances of eyewitness testimony, "leading to gradual change and reform in the fundamental bases of our legal system."

The Patrick Suppes Prize honors accomplishments in "three deeply significant scholarly fields," the prize rotating each year between philosophy of science, psychology, and history of science.

The Society also noted that "it is especially appropriate for Elizabeth Loftus to receive this Prize because Pat Suppes was Dr. Loftus's thesis advisor. If Pat were living today he would be ecstatic to see Elizabeth receive this award."

* * *

In related news, the *New Yorker* has recently published a lengthy and deeply reported personal profile of Loftus and her work and some of the ensuing controversies. Initially titled "How Elizabeth Loftus Changed the Meaning of Memory," the eleven-page article by Rachel Aviv appeared online March 29, 2021, and then was published in the April 5 *New Yorker* under the title "Past Imperfect."

Former *New Scientist* Editor Bernard Dixon Dies

Bernard Dixon, British science writer and former editor of *New Scientist* magazine, died October 30, 2020, at the age of eighty-two.

Dixon was elected a fellow of the Committee for Skeptical Inquiry (then CSICOP) in 1980. He was also active with the British Association for Science (then the BAAS) and the Council for Science and Society.

Dixon edited *New Scientist* from 1969 to 1979, bringing his own brand of humor and a concern for issues of science and society to the magazine.

"Thanks to his own blend of curiosity, enthusiasm, and skepticism, he struck a successful—and at the time, unique—balance between accessible science reporting, analysis of new technology, and scrutiny of relationships between science, government, and society," wrote Georgina Ferry in an obituary in *The Guardian*.

"Nothing was sacred, as long as it was about science," said Michael Kenward, who succeeded Dixon as editor of the magazine in 1979. Kenward wrote *New Scientist*'s own tribute to Dixon in its December 5, 2020, issue.

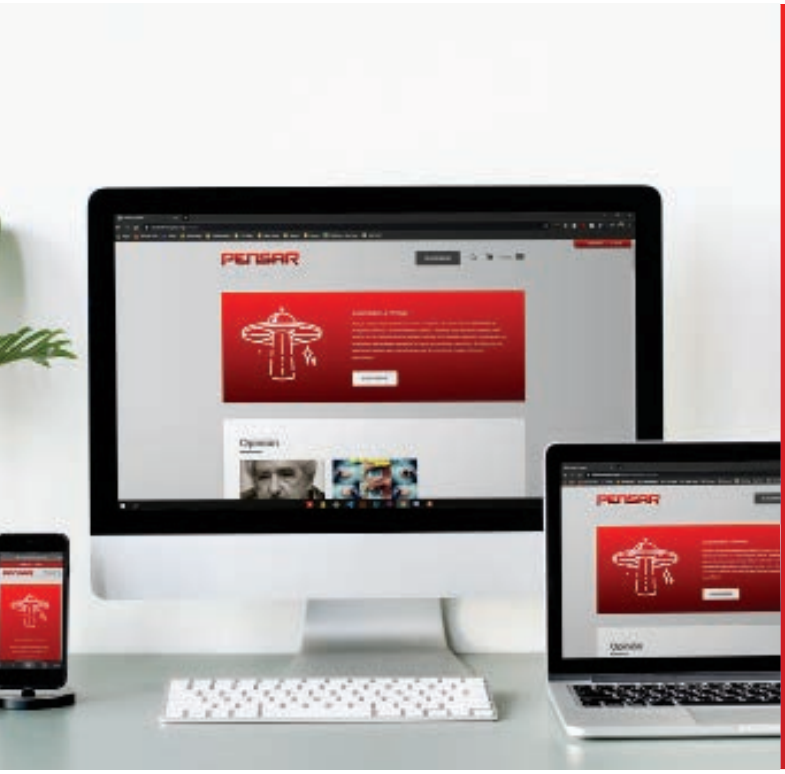
Another Dixon recruit, Lawrence McGinty, said, "Under Bernard's leadership, *New Scientist* became authoritative and entertaining, the voice of science that everyone could understand."

Dixon got a PhD in biology from King's College in Newcastle upon Tyne and after a year of research in microbiology became a science journalist. He joined *New Scientist* in 1968 and became its editor the following year.

In 1974, Dixon and *New Scientist* colleague Joseph Hanlon conducted an investigation exposing spoon-bender Uri Geller. Their search for rigorous evidence that he had psychokinetic powers turned up nothing—though they caught him attempting to bend a key on the metal frame of a chair.

Dixon left the magazine in 1979 to take up freelance writing and become European editor of *Omni*. He later wrote columns for *Current Biology*. His books include *What Is Science For?* and *Beyond the Magic Bullet*, an exploration of the fallacy that there is a pill for every ill.

In 2000, Dixon was appointed to the Order of the British Empire (OBE). He expressed delight but later told the British Library's Oral History of British Science that he made it clear he would not accept the award from Prince Charles because of his ill-informed statements about the genetic modification of crops. Dixon opted instead to have the medal sent to him from the lord lieutenant of Greater London—through the post in a Jiffy bag.



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The 'Miraculous Drops of José Gregorio Hernández' in Venezuela

GABRIEL ANDRADE

Anti-vaxxers all over the world have capitalized on the temporary hold some European countries have placed on the AstraZeneca COVID-19 vaccine due to some cases of blood clotting. We now know that reports about its risks have been overblown, and after a thorough evaluation, European authorities once again resumed the use of this vaccine.

Yet other countries have also refused to authorize the use of the AstraZeneca vaccine. While concerns about its safety may seem legitimate, there may in fact be political reasons behind this move. Venezuela is a case in point.

Ever since Hugo Chávez's rise to power in 1999, Venezuela's socialist government has pursued an anti-Western nationalist agenda—including a stance against Western pharmaceutical corporations. In the past eight years, Venezuela has endured a deep humanitarian crisis and is now desperately in need of international assistance to address COVID-19. Yet Venezuela's government has insisted that it does not need help from any Western corporation (although they will accept the Russian vaccine Sputnik), and for that very reason the AstraZeneca vaccine has been refused in Venezuela. Instead, the government has announced its own solution to the pandemic: a product known as carvativir.

Ever since Hugo Chávez's rise to power, Venezuela has pursued an anti-Western nationalist agenda—including a stance against Western pharmaceutical corporations.

According to Venezuela's President Nicolás Maduro, you only need "ten drops [of cartavivir] under the tongue every four hours, and the miracle is done," meaning that patients with COVID-19 are miraculously cured. Indeed, Maduro marketed the new product as the "miraculous drops of José Gregorio Hernández."

As it happens, the use of José Gregorio Hernández's name for marketing purposes is not fortuitous. Hernández was a renowned Venezuelan physician at the beginning of the twentieth century. At the time, the practice of medicine in Venezuela was very rudimentary, and Hernández significantly contributed to its modernization. He studied in Europe and brought back to his native

country knowledge and technological equipment to improve Venezuela's healthcare system.

Hernández was a deeply devout Catholic and never came to accept Darwin's theory of evolution, though he was always very careful not to allow his personal beliefs to get in the way of his medical practice. Hernández was fully aware that Venezuela needed to modernize its medical system, and he understood that the only way to do so was by embracing scientific principles. Consequently, he never sympathized with religiously inspired alternative medicine.

Hernández was run over by a car in 1919, and his untimely death soon spawned a religious cult. Practitioners of the Maria Lionza cult (a Venezuelan religion that syncretizes Catholicism with traditional indigenous and African animist beliefs) have elevated him to their altars, and he is now considered one of the most important spirits that heal people. As is frequently the case with this type of religious manifestation, there have been no independently verified miraculous cures in the Maria Lionza group.

Though the Catholic Church has never been at ease with this cult, in the past fifty years there has been a push to canonize Hernández as a saint. On June 19, 2020, he was formally beatified by Pope Francis. As is standard in the canonization processes by the Catholic Church, some miracles need to be attributed to the candidate. In this case, Hernández was attributed with miraculously curing Yaxury Solórzano, a ten-year-old girl who suffered a gunshot to her head. The girl underwent surgery, and her prognosis was poor. Her mother prayed to Hernández, and twenty days after the surgery, the girl made an almost complete recovery. Needless to say, this is hardly a legitimate miracle. Overcoming a poor prognosis may be improbable but not physically impossible, and for that very reason, that cannot count as a real miracle. Yet for Catholic standards, this was good enough.

It is well known that many Catholic canonizations have a political dimension, and the case of José Gregorio Hernández is no exception.

It is well known that many Catholic canonizations have a political dimension, and the case of José Gregorio Hernández is no exception.

While Venezuela's socialist government has not cared much about religion and its relationship with the Catholic clergy has been strained at various points, it showed a particular interest in Hernández's canonization. Venezuela did not have a Catholic saint, and Venezuela's government saw it as an opportunity to expand its nationalist ideology. In that regard, the canonization of Hernández was portrayed as some sort of nationalist vindication vis-à-vis the Church's excessive focus on European saints.

As part of this endeavor, Venezuela's government pushed the canonization agenda by promoting the alleged miracles attributed to Hernández. For that very reason, when presenting carvativir to the public, Maduro spoke of it as if it were yet another demonstrably miraculous deed by Hernández.

As it happens, there is nothing miraculous about carvativir. It is a very rudimentary solution consisting of the herb thyme. This particular herb has been frequently used in traditional medicine, but no trial has established that it is effective in treating COVID-19, and Facebook has frozen Maduro's page because of its misinformation regarding carvativir.

However, for Venezuela's government that matters very little. In fact, under the government's ideology, clinical trials are not very relevant. Being imbued in far leftist ideology, many Venezuelan officials have repeated the frequent rhetorical point that science ought to be decolonized, and that implies relying less on Western-imposed clinical protocols. It also implies giving more credence to so-called "indigenous ways of knowing" and alternative medicine, in which herbs such as thyme play an important role. In this heavily politicized diatribe, the name of José Gregorio Hernández has been hijacked. Widely respected for his commitment to scientific medicine while he was alive, after his death Hernández has come to represent magical thinking.

In a heavily politicized diatribe, the name of José Gregorio Hernández has been hijacked.

Skeptics urgently need to promote critical thinking in Venezuela, so as to assess the real efficacy of carvativir in treating COVID-19 and the real risks of the AstraZeneca vaccine. In so doing, nationalist prejudices must be left aside, and the weight of the evidence must be considered, regardless of its political or religious implications. This is probably what Hernández himself would have done. By promoting critical thinking in Venezuela, skeptics will rescue Hernández from those who have seized upon his image to promote unreason and pseudoscience. ■

Gabriel Andrade received a PhD from the University of Zulia (Venezuela) in 2008. He worked as Titular Professor at University of Zulia from 2005 to 2015, teaching courses on the humanities and writing numerous books and articles in Spanish. He then moved on to teach at the College of the Marshall Islands (Republic of the Marshall Islands), Xavier University School of Medicine (Aruba), and St. Matthew's University School of Medicine (Cayman Islands). He is now an assistant professor in the College of Medicine at Ajman University, United Arab Emirates.

[INVESTIGATIVE FILES JOE NICKELL

Joe Nickell, PhD, has been a magician, Pinkerton detective, and more; see his website (www.joenickell.com) and select "Personas."

Role-Playing Detectives and the Paranormal

I knew I was a detective at the age of eight, but my career did not actually begin until I was twenty-five in 1969. In the more than half a century since, I became various kinds of sleuth—ranging from *paranormal* to *literary* to *homicide*—including police-licensed *private investigator* for the first American detective agency, the Pinkerton's. Founded in the early 1850s, its trademark—an open eye with the words "We Never Sleep"—gave rise to the term *private eye*. The agency taught its "operatives" such essential skills as "shadowing" (surveilling), "roping" (artfully fishing for information), and much more, including role-playing and disguise.

Now, *role* refers to an actor's part and by extension any part or function played in real life. (It is from the French *rôle*, referring to the roll of paper on which an actor's part was written.) Role-playing is extensively used by detectives—as in the "good cop, bad cop" technique in interrogation—and is central to undercover work. (My ability to role-play was valued by Pinkerton's to the extent that certain assignments were saved for me. I became, for instance, an entry-level "lens polisher" in an optics lab where gold was missing.)

The following pages treat role-playing in detective work as it relates especially to paranormal claims. We will consider the pioneering Allan Pinkerton himself; Kate Warne, whom Pinkerton hired as America's first woman detective; magician Harry Houdini, who spent the last years of his life exposing phony spiritualists; Houdini's clever advance agent Rose Mackenberg; and finally James Randi, who inspired skeptics around the world—not a few of whom have themselves become role-playing detectives.

Allan Pinkerton

America's first private detective, Allan Pinkerton (1819–1884), was ironi-

cally a Scottish fugitive. (A radical Chartist, he brought his strong views to America: he opposed slavery—championing the cause of John Brown until Brown was hanged—and he believed women should be allowed to vote.[1]) He and his new wife settled in a cabin he built in frontier Illinois in 1843, and he resumed his trade of cooper.

One day in 1847 while seeking wood for his barrels on a lush island of the Fox River, Pinkerton came upon what appeared to be a clandestine camp. He returned one moonlit evening for a surveillance and then, accompanied next time by the sheriff and his posse, helped arrest a gang of coin counterfeiters. Discovering himself a born detective, he soon caught another counterfeiter named John Craig. Urged by village businessmen, Pinkerton instinctively played the role of a man willing to engage in low-risk passing of bogus $10 bills, which he purchased at discount (with the businessmen's money). After Pinkerton made a second, bigger purchase, he and a deputy sheriff arrested Craig. He was indicted on Pinkerton's testimony before the grand jury.

Pinkerton himself then became a deputy sheriff of Kane County, but subsequently (about 1849) he moved to Chicago when newly elected Mayor Levi Boone named him the city's first detective. He survived an initial attempt on his life. Two slugs in his arm—fired so close his coat was set aflame—were later excised by a surgeon along with pieces of bone and cloth (according to a September 9, 1853, article in the *Daily Democratic Press* [Horan 1967]). After about a year, he resigned, complaining of "political influence" (Horan 1967, 15–23), but soon he had another badge.

As Special United States Mail Agent, Allan Pinkerton was appointed to solve a number of thefts and robberies that plagued the Chicago Post Office. He arranged to be hired there in the role of a mail clerk, spending weeks handling mailbags and loading them onto mail cars—all the time keeping an eye out for any worker who might be removing envelopes containing postal money orders or other valuables. He struck up friendships, and one clerk eventually rewarded him by bragging that his fingers were "so sensitive he knew when a letter contained a penny or a dollar." Pinkerton sought opportunities to watch the man from behind a stack of parcels and discovered him pocketing envelopes. He soon had the man's signed confession (Horan 1967, 23–24).

In the early 1850s, he founded his Pinkerton's National Detective Agency. He began with five operatives—one, George Bangs, doubling as a first-rate operative and office manager. It is said that "the Chicago office at times resembled the backstage of a theatre," with Pinkerton and Bangs giving instructions on role-playing. Also, Pinkerton maintained a large closet in his personal office stocked with disguises (Horan 1967, 28–29).

It is said that "the Chicago [Pinkerton's] office at times resembled the backstage of a theatre," with Pinkerton and Bangs giving instructions on role-playing.

Pinkerton led the fight against bank, express-company, and railway robbers; foiled an assassination plot against president-elect Lincoln; created a spy agency during the Civil War; and sent its role-playing operatives behind enemy lines. Over time, he established branch offices across the country and created a pioneering Rogues' Gallery of photos—among other innovations. And then there were his detective stories. To meet the public appetite for these, Pinkerton cranked out best-selling books of detective adventures. He outlined stories—based on actual Pinkerton investigative techniques—then turned them over to ghostwriters to expand with description and dialogue (Horan 1967, 44, 52–61, 78–79, 288; Waller 2019, 18–22, 97–98). In his *The Spiritualists and the Detectives*, Pinkerton concluded, for example, that a central spirit medium's phenomena "did not reach to the dignity of respectable sleight of hand" and could be duplicated by "lady operatives in my employ" (Pinkerton 1876, 325).

Kate Warne

Allan Pinkerton's liberal attitudes were to come to the fore regarding women. One afternoon in 1856, a young lady—a widow aged twenty-three named Kate Warne (ca. 1833–1868)—was answering a Pinkerton advertisement for detectives. Allan Pinkerton was taken aback because he had never known of a female in that capacity, but he asked how she thought she might be of value. Warne was ready for the question, explaining in detail how she could "worm out secrets in many places to which it was impossible for male detectives to gain access" (Horan 1967, 29). She seemed to understand instinctively such techniques as role-playing and roping. Pinkerton thought about it overnight and the next day hired the first career woman detective in America, if not the world. By 1860, Pinkerton's even had a "Female Detective Bureau" headed by Warne.

Until her untimely death in 1868, she played effective roles and wore appropriate disguises for Pinkerton cases. As one of a team of operatives assigned to a $40,000 Adams Express Company robbery, Warne was superb: she went undercover, adopting the persona of a wealthy forger's wife so as to establish a common bond with the suspect's wife. Warne stayed at a local boardinghouse, impressing the Pennsylvania village "with her fine clothes and regal manners," as she carried out her assign-

Until her untimely death in 1868, Warne played effective roles and wore appropriate disguises for Pinkerton cases.

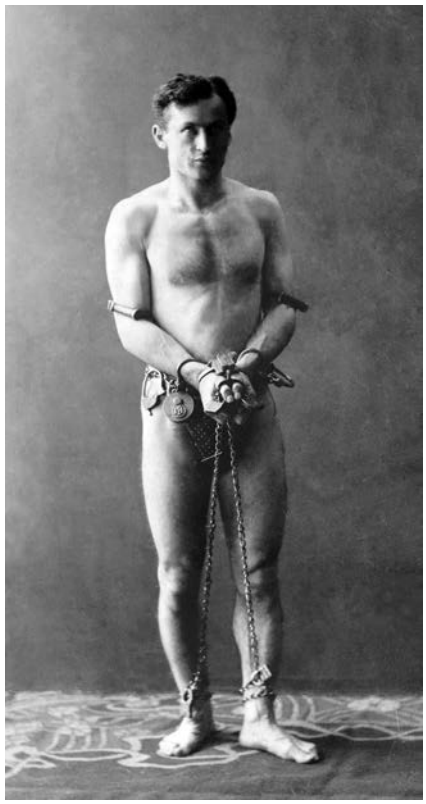
ment to cultivate the woman. When the woman asked Warne's advice about giving stolen money for safekeeping to a man her husband knew only from jail—another Pinkerton!—Warne knew just how to advise her. Pinkerton's recovered all but about $400 of the stolen money (Horan 1967, 45–48; Waller 2019, 14–15).

Warne is most famous for her role in the "Baltimore Plot"—a conspiracy to assassinate newly elected President Lincoln in 1861 as he was en route to Washington, D.C., to take the oath of office. Warne was one of several operatives whom Pinkerton sent in advance into Baltimore, where Lincoln was to change trains. Attired as a flirtatious "southern belle," Warne befriended local secessionists and collected intelligence regarding the widely rumored plot. Then she booked seats in a special train sleeper car "for a sick friend and party." A stooped Lincoln was slipped on board, disguised with an overcoat draped over his shoulders and a less extreme hat than his signature "stovepipe."

At Lincoln's low-key boarding, an American Telegraph Company wire climber—on Pinkerton's orders—cut crucial lines so other conspirators could not be alerted. Pinkerton operatives were positioned along the route to flash secret "clear ahead" signals, and Warne "carefully drew the curtains and charmed the curious conductor" (Horan 1967, 52–57; Waller 2019, 15–19).

During the Civil War, Warne was one of Pinkerton's chosen agents for his intelligence-gathering bureau (a forerunner of today's U.S. Secret Service). Whereas Confederate General Robert E. Lee believed female agents were unreliable, "not apt to take a calm and dispassionate view of events attending the war" (qtd. in Waller 2019, 184), Warne and the other female U.S. spies, at least, were proven professionally adept.

In his book *The Detective and the Somnambulist: The Murderer and the Fortune Teller* (1874), Pinkerton relates a later undercover adventure of Warne's in which she assumed the role of a fortune teller to obtain information from a suspected prisoner's confidants. In the narrative (one of his "detective stories"), Pinkerton even rented a space for Warne to use as part of that role. Specifically, she was "posing as a clairvoyant with costume and makeup to convince a superstitious woman to admit to poisoning her brother" (Waller 2019, 13–14).



Harry Houdini in his famous handcuffs and shackles. Image Credit: CircaSassy - Flickr, https://www.flickr.com/photos/circasassy/8210604182.

The great magician and escape artist Harry Houdini spent his last years exposing widespread spiritualist fraud.

Harry Houdini

The great magician and escape artist Harry Houdini (born Ehrich Weiss, 1874–1926) spent his last years exposing widespread spiritualist fraud. Spiritualism is a religion based on the alleged communication with spirits of the dead. It may occur through intercessors called "mediums," typically in dark-room sessions known as séances.

Houdini crusaded against phony spiritualists, seeking out elderly mediums who taught him the tricks of the trade. For example, although sitters touched hands around the séance table—in part to prove they were not engaging in deception—mediums had clever ways of regaining the use of one hand. One method was to slowly move the hands close together so that the fingers of one hand could do double duty. This allowed the production of special effects. Houdini, of course, made an excellent detective for exposing tricksters: as an old proverb advises, "Set a thief to catch a thief."

The famous magician would often disguise himself so as not to be recognized by his quarry. In one illustrative case in Cleveland, for example, Houdini—accompanied by a reporter and a county prosecutor—was disguised for his role-playing with old clothes and heavy eyeglasses. The trio joined the medium, George Renner, at his home and sat with the others around the large table in the dark. At one point, Houdini whispered to the prosecutor that he was leaving his seat. Then, while a spirit trumpet was apparently floating in the air (typically one bore luminescent bands so its position could be seen in the dark), a light suddenly came on to reveal the medium—his eyes blinking and his hands stained with lampblack!

The magician had been up to a trick of his own. In the dark, he had snuck close to Renner's trumpets and secretly smeared them with the telltale powder. Holding a flashlight, Houdini announced "Mr. Renner, you are a fraud" and called attention to the lampblack on his hands.

Renner shouted, "I have been a medium for forty years, and I have never been exposed."

"Well you are now," Houdini replied, identifying himself as he took off his disguising heavy glasses (Polidoro 2001, 181–182).

To make his exposés more numerous and effective, Houdini began to send advance persons—his niece Julia Sawyer, for example—to visit mediums for personal séances at their homes or

to attend their public presentations. In this way, Houdini could know what to expect, divine how some "materialization" or other trick might be performed, and come prepared to more effectively discredit a phony spirit communication. The person who became Houdini's chief agent in this regard was a colorful woman who gave new emphasis to role-playing and disguise.

Rose Mackenberg

It is not too much to say that Rose Mackenberg (1892–1968) was a one-woman troupe of actress-detectives. Indeed she was herself a Brooklyn private investigator. According to Massimo Polidoro (2001, 180):

> She was particularly adept at disguise, and would present herself as a jealous wife, a simpleminded maid, a neurotic schoolteacher, or a wealthy eccentric. At every séance she would receive assurances or news from dead children or husband [she had neither], suggestions on how to invest money, or what to do about her job. When Houdini arrived in the city, Rose would pass him all the details about the mediums she had visited.

Photographs show her remarkable facility in creatively styling herself to fit a role.

No doubt Mackenberg's costuming was at first simply an aid to her role-playing: that is, helping her play a part. But as she became better known to spiritualists, her creative garbs likely assisted her in hiding her identity. (This double benefit I too have experienced, as no doubt did Houdini. Kate Warne, on the other hand, would have shunned notoriety in the first place, so her disguises would not have needed to conceal her appearance.) If Mackenberg's work sometimes seems a bit caricaturish, it was all the better: she would show up the crook so humorously that, at the end, one would ask, who was the fool after all? Psychologist Loren Pankratz (1995, 29) noted: "The findings of Rose Mackenberg have strengthened my opinion that spiritualism was not merely a silly fad. Most spiritualist practitioners were morally corrupt and based their presentations on fraud."

Indeed, speaking of being corrupt, some of the male mediums, Mackenberg reported, victimized her also by sexual harassment. A feigned trance state gave more than one such medium a seeming excuse to touch Mackenberg. This so disgusted Houdini that he suggested she might want to carry a pistol, but she declined (Polidoro 2001, 181).

Becoming Houdini's most celebrated agent, Mackenberg even went so far as to collect ministerial credentials she had purchased from numerous spiritualist churches. When Houdini wanted to publicly demonstrate with what ease one could claim to be a "spiritualist minister," he would introduce her to exhibit her collection of bought credentials.

After Houdini's premature death on Halloween 1926, Mackenberg determined to continue his effective crusade by herself. She went on a lecture tour, wherein she effectively demonstrated to service clubs and various organizations such mediumistic tricks as levitating spirit trumpets, producing ectoplasm (an imagined spirit substance), and reading sealed messages by the help of spirit guides. Her articles were syndicated and appeared widely. As an example, one of a series of eight, published in *The Winnipeg Evening Tribune* magazine section (between February 23–April 13, 1929), is headlined, "Mystic Cameras Dupe Bereaved with Fascinating Facts about Ectoplasm," and it bills our heroine as "Houdini's Clever Girl Detective."

Mackenberg had worked for Houdini for two years and had, by her own count, investigated over 300 seers and psychics. She continued that career for two more decades, telling a Hearst newspapers reporter in 1949, "I smell a rat before I smell the incense" (qtd. in Edwards 2019). I think the great Houdini would have been very proud.

James Randi

World-famous magician and escape artist James "The Amazing" Randi (born Randall James Hamilton Zwinge, 1928–2020) was the very embodiment of Houdini. He also became a great proponent of role-playing and disguise, as in infiltrating the theatrical performances of sham faith healers to expose their deceptions. One of his sensational exposés featured Pentecostal evangelist and director of a religious empire Rev. Peter Popoff.

How Miss Mackenberg Used to Dress to Consult Mediums
As a Rustic Schoolteacher.
As a Small Town Matron.
As a Credulous Servant Girl.
As a "Believing" Semi-Invalid.
As a Woman Seeking Lost Relatives.
As a "Vamp" from the Country.
As a Tipsy Consultant.

Courtesy of San Diego magician Tom Interval. Original copyright held by International Feature Service Inc., Great Britain.

Randi focused on Popoff's apparent gifts of healing and what is called the Word of Knowledge—allegedly consisting of receiving, directly from God, special messages that are then to be imparted to others. For example, at a service in Anaheim, California, in 1986, Popoff called out, "Virgil. Is it Jorgenson? Who is Virgil?" When a man in the audience identified himself, Popoff continued, "Oh, glory to God. I'll tell you, God's going to touch that sister of yours all the way over in Sweden." Popoff then broke the man's cane over his knee and stood by as the amazed audience watched the man walk about unaided,[2] giving praise to both Popoff and God (Steiner 1989, 124–126).

World-famous magician and escape artist James "The Amazing" Randi was the very embodiment of Houdini.

James Randi was a great observer, and he wondered at the healer wearing an apparent hearing aid! He began to suspect the device might actually be a tiny radio receiver and that someone—other than God—was secretly broadcasting such information. So our incognito investigator smuggled in an electronics expert with computerized scanning equipment and, intercepting the messages, discovered where they really came from: the evangelist's wife in the ministry's TV trailer parked outside! She obtained the relevant information from so-called prayer cards that attendees filled out before the service and broadcast selected facts to Popoff's "hearing aid." Randi, using before-and-after videotapes of one intercepted session with Mrs. Popoff's voice, exposed the whole affair on Johnny Carson's *The Tonight Show* (Randi 1987, 141–150; Nickell 2013, 197–200).

Early in his work to expose phony spiritualists, miracle workers, psychic wonders, and others of their ilk, Randi turned his attention to a sensational performer from Israel named Uri Geller. He allegedly had a remarkable ability: he could apparently bend metal simply by looking at it! Using only his mental powers, he also appeared to read people's minds, move objects, start or stop clocks and watches, "see" while blindfolded, and perform other wonders. These strange powers were called the "Geller Effect" by parapsychologists who had tested him. Randi was suspicious—to say the least. He knew all too well that non-magicians, such as Geller's examiners, could easily be fooled. He suspected there might be a better term for the "Geller Effect," namely, *magic tricks*. What was needed, Randi knew, was for him to get a close-up look at the young marvel's feats. Gambling that Geller probably did not know what he looked like, Randi arranged to join in when Geller was invited to perform at the offices of *Time* magazine. Posing as a *Time* editor and changing his appearance to look the part, Randi was transformed by a three-piece suit. In his role-playing, he feigned surprise at Geller's tricks. For example, although the psychic pretended to cover his eyes while a secretary made a simple drawing, he actually peeked. This enabled him to seemingly read her mind and reproduce the drawing. Also, instead of bending a key "by concentration," as he claimed, Geller bent it against a table when he thought no one was looking. These and other tricks would eventually be exposed in Randi's book *The Magic of Uri Geller* (1975; Nickell 1989, 52–54).

As Randi continued his exposés, the charlatans began to be on the lookout for him. At one theatrical event, he had dyed his full gray beard brown, affixed a brown wig, and donned a flashy jacket. As a consequence, a security "bully" came right to his seat and inquired if he was James Randi! Our hero tried to direct the guard elsewhere, and when he went off to report having found him, the magician quickly transformed himself. That is, he rushed to the men's room where he ditched the wig and jacket and washed out the dye. He quickly took a seat up front as the real James Randi, whereupon the event had begun, the lights were dimmed, and he thereafter went unnoticed (Bartlett 1986)!

Having known James Randi for over half a century—as colleague, mentor, and friend—I will just say his exploits are far more than legendary.

The same is true of his intrepid forerunners—Rose Mackenberg, Harry Houdini, Kate Warne, and Allan Pinkerton. I just wanted to bring them out from behind the curtain of history for one more bow. ■

Acknowledgments

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Notes

1. It was after Allan Pinkerton's death that his sons Robert and William notoriously allowed the firm to use operatives and guards against the labor movement! (Allan had himself been a union member in Scotland.) That practice was later ended with a strong ethical code.

2. More often than not, a person with a cane could walk without one—especially because the excitement of such an occasion helps temporarily mask pain.

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[REALITY IS THE BEST MEDICINE HARRIET HALL

Harriet Hall, MD, also known as "The SkepDoc," is a retired family physician, a CSI fellow, and an editor of the Science-Based Medicine blog. Her website is www.skepdoc.info.

Illness, *Healing*, and Other Terms That Can Be Confusing

Disease vs. Illness

The words *disease* and *illness* are often used interchangeably, but their meanings are very different. Diseases are biomedical entities that cause impairment of the normal functioning of the body, while illness refers to the way a patient *experiences* a sickness. There can be disease without illness and illness without disease.

Diseases may have external or internal causes. COVID-19 is an infectious disease that occurs when a microorganism in the external environment takes up residence in the body. Diabetes is an internal dysfunction where the body no longer produces enough insulin. There are many categories of disease, including infectious diseases, hereditary diseases, deficiency diseases, and physiologic diseases. Diseases can be classified as congenital or acquired, acute or chronic, iatrogenic (caused by medical treatment) or idiopathic (cause not known). Terminal diseases are those expected to end in death. AIDS was once considered terminal; it is still not curable but has become a manageable disease that patients can live with and that may not even decrease their life expectancy. When the cause of a disease is not understood, it is sometimes referred to as a "syndrome" or a "disorder."

Patients can have a disease and not know it. When patients test positive for COVID-19, many are asymptomatic, having the disease but no symptoms. A heart attack may be the first sign of a long-standing cardiovascular disease. The coronary arteries have become increasingly narrowed by atherosclerotic plaques over the course of many years, but the patient remains unaware until a complete blockage or a ruptured plaque deprives heart muscle cells of the essential blood supply they need to function. Only then do the cells begin to die, and the patient experiences chest pain. Conversely, patients may feel sick and be suffering from an illness when there is no actual impairment of biologic functions. One example is hypochondria.

Dis-ease is an imprecise term often used in complementary and alternative

CAM doesn't treat disease; it treats illness and cares more how an individual patient feels than about scientific evidence.

medicine (CAM) to indicate a vague feeling that all is not well or to suggest that some optimum condition of "ease" and perfect health is lacking and can be attained only by following the advice of the CAM practitioner. *Illness* refers to the personal experience of suffering, but it is also a social experience conforming to the norms of society and influenced by culture, education, beliefs, and expectations. Diseases can kill, but illnesses cause most of human suffering. CAM and mainstream medicine are often at odds because they don't speak the same language. CAM doesn't treat disease; it treats illness and cares more about how an individual patient feels than about scientific evidence. It relies heavily on suggestion and placebo effects. CAM sustains hope. Everyone resists the idea that there's nothing more that can be done in the face of sickness. It's not acceptable to "do nothing," even when doing nothing is the safest and most reasonable approach. Scientific medicine is often perceived as impersonal, mechanical, uncaring, and destroying hope. Taking an ineffective CAM remedy lets patients believe they are *doing something*. Patients can benefit from the illusion that they are in control of their destiny and from the positive and caring interaction with another human being.

Cure vs. Healing

Cures are rarely achieved, but *healing* is always possible. The role of doctors is "To cure sometimes, to relieve often, to comfort always," according to an adage that originated in the 1800s with Dr. Edward Trudeau, the founder of a tuberculosis sanatorium. (Back then, there was no cure for tuberculosis, so relief and comfort were all he *could* offer.) In some cases, doctors claim to have cured (for instance, by excising a tumor or removing a foreign body), but in most cases, it is really the body that cures the disease, and the doctor's role is limited to facilitating that process.

Healing means different things to different people. Wounds may be due to trauma or surgical incisions, and it is usually obvious when they are healing. The healing process is complex but fairly well understood. First, there is an inflammatory phase with a clotting cascade, a response of blood vessels, and the arrival of white blood cells. Then there is a proliferative phase where new tissues replace the damaged tissues. Then maturation and remodeling occur. The healing of a broken bone can be verified by X-ray.

A different meaning for *healing* was brought home to me when I watched a documentary about João de Deus (John of God), a psychic surgeon in Brazil. He is a charlatan who is currently in prison for sexually abusing 600 women, including his own daughter. They interviewed a woman in Italy who had traveled to Brazil to be treated by him and who firmly believed he had healed her. She had advanced metastatic breast cancer and had stopped the conventional treatments of her oncologist when she decided to see the psychic surgeon. She died in 2003. At the time of the interview, her disease was progressing and she was dying of cancer, yet she claimed to have been healed. Was she in denial? Didn't she realize the cancer was killing her? What was she thinking? Was this a triumph of hope over reality? I eventually understood that to some people, *healing* means a psychological process where they have come to terms with their diagnosis. They have achieved acceptance and are no longer distressed. An article in the *Annals of Family Medicine* explains, "Healing was associated with themes of wholeness, narrative, and spirituality. Healing is an intensely personal, subjective experience involving a reconciliation of the meaning an individual ascribes to distressing events with his or her perception of wholeness as a person" (Egnew 2005). Its author's conclusion: "Healing may be operationally defined as the personal experience of the transcendence of suffering" (Egnew 2005). Okay, but measuring that personal experience is problematic. That concept of healing is hard to pin down, and it relies on patient self-reporting. It is more of a metaphysical concept than a scientific one.

Pain vs. Suffering

There is no convenient objective way to measure pain. We can only accept a patient's report that they are experiencing pain. We ask patients to rate their pain on a scale of one to ten, where ten is the worst pain, zero means no pain,

and anything over eight is considered severe pain. I hate it when I am asked to rate my pain on that scale; it lacks nuance. I never know what to say, and my answer will vary depending on my mood. What should I answer if I am pain-free at the moment, but the pain was bad enough to keep me from sleeping last night? What if I wouldn't call it "pain" but simply "discomfort"? What if a patient is a stoic who never complains? What if the patient is a person who habitually exaggerates or imagines symptoms? What if he or she reports a pain level of fifteen out of ten? A good clinician can investigate by asking questions such as "Do your teeth itch? Do your stools glow in the dark?" If patients answer yes to all such questions, doctors will know to discount their reports as unreliable.

Pain is a physical sensation; suffering is a psychological one. Pain can occur without suffering, as in the famous movie scene where Lawrence of Arabia extinguishes a match with his bare fingers and explains that the secret is not minding that it hurts. And suffering can occur without pain. Anticipation of pain often causes more suffering than the pain itself. *Pain and suffering* is a legal term used in the courts to help determine monetary compensation for injuries.

Pain is a physical sensation; suffering is a psychological one.

Suffering is determined by the sufferer's thoughts. People try to interpret the meaning of their pain. For Lawrence of Arabia, the pain in his fingers meant an opportunity to impress other people. Can you expect the pain to be over soon? Will it soon stop with a desirable outcome, such as the birth of a baby? Does the pain mean you are going to die? Can you expect the pain to get worse?

Veterinarians claim to know when an animal is suffering, but they don't have access to the animal's thoughts.

They are limited to observing the animal's behavior. If an animal stops eating and is less active, what is going on in its mind? Does it experience suffering, or does it merely feel the experience of not wanting to eat or move? Animals live in the moment, not in the past or future.

For that matter, are crying babies experiencing suffering, pain, or just frustration? Is crying a way to manipulate adults into satisfying their needs with a diaper change or a feeding? Animals and newborn babies don't have the mental development to think like adult humans. Newborns are incapable of obsessing about past instances of pain or anticipating future suffering. They are incapable of speculating about what the pain might mean. New babies may cry when blood is drawn, but they also might cry just as vigorously when being restrained or having their clothing changed.

When I was an intern, two patients on our surgical ward had the same operation (inguinal hernia repair). One was an adult who continued to complain of pain for days and refused to get out of bed; the other was a toddler who was happily running around the ward right after the surgery. The toddler had no expectation that he would be incapacitated by pain; the adult was unduly worried and avoided doing anything he imagined might cause more pain.

Words matter; improving the precision of our language should improve the clarity of our thinking.

Hypnosis could be thought of as "mind over matter." It can reduce the experience of pain through selective attention/inattention; the suggestions of the hypnotist direct the patient's thinking. Similarly, unmedicated childbirth utilizes thought control and distraction to reduce the need for anesthesia or other drugs.

In conclusion, remember that words matter; improving the precision of our language should improve the clarity of our thinking. Science-based medicine treats diseases, while CAM treats illnesses. *Healing* is an elastic term that may not mean what you thought it did. And suffering is not the same as pain; each can occur without the other. ■

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[BEHAVIOR & BELIEF STUART VYSE

Stuart Vyse is a psychologist and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a fellow of the Committee for Skeptical Inquiry.

Beware the Child Rescuers

Statue of Simon of Trent, an Italian child whose disappearance and death was blamed on the leaders of the city's Jewish community. (Wikimedia)

As he drove from his home in North Carolina to Comet Ping Pong in the northwest neighborhood of Washington, D.C., Edgar Maddison Welch recorded a message for his two young daughters: "I can't let you grow up in a world that's so corrupt by evil, without at least standing up for you and for other children just like you" (Miller 2021). Later that day, Welch walked into the crowded pizzeria carrying an AR-15 semi-automatic rifle in search of a pedophilia ring that people on the internet had told him Hillary Clinton was operating in the building's basement. As the diners ran from the restaurant, Welch walked around the building looking for an entrance to the child abuse operation. When he found a door he couldn't open, he fired his gun at the lock. Eventually, he put down his weapons (he was also carrying a handgun) and submitted to being arrested.

People have always had extreme beliefs, but it takes emotion to put those beliefs into action, and children stir up emotions. Children are vulnerable and beloved, and we make enormous efforts to protect them from illness, injury, and exploitation. Unfortunately, there are people in the world who are capable of horrible acts, and children can rarely defend themselves when targeted. They are both precious and fragile. We have come to a point where—by a shockingly wide margin—most accusations of child abuse are false.

If you doubt this last claim, recall that an NPR/Ipsos poll conducted in December 2020 found that 17 percent of Americans agreed with the statement, "A group of Satan-worshipping elites who run a child sex ring are trying to control our politics and media." Seventeen percent. Clearly, these are not specific accusations, but this obviously false statement is a core belief of the QAnon movement (Rose 2020; Vyse 2021). It seems clear that the urge to protect children sent Welch on his misguided rescue mission, but this is just one cautionary tale in the long history of false claims of child injury.

A Brief and Idiosyncratic History of False Claims of Child Victimization

The Blood Libel Myth

On the day before Easter in 1144 CE in the town of Norwich, England, a twelve-year-old boy named William was found dead. His uncle, a priest named Godwin Sturt, accused Jews of murdering the boy. Thomas of Monmouth became the caretaker of William's tomb, and although he was not in Norwich at the time of William's death, he wrote an account of the boy's life, *The Life and Passion of St. William the Martyr of Norwich*, which described the alleged murder of William by Jews as part of a Passover ritual. In an effort to advocate for William's canonization, Thomas portrayed him as a martyr and reported a number of miracles attributed to him (McCulloh 1997).

The blood libel myth, as well as other anti-Semitic ideas, led to the scapegoating and murder of Jews during times of plague.

Thomas of Norwich's book was neither the first nor the last report of the blood ritual myth. Romans had accused early Christians of kidnapping non-Christian children for use in secret ritual sacrifices, and much later, during the French Revolution, popular rumor accused aristocrats of kidnapping children to use their blood in

"Aquelarre" (Witches Sabbath) painting by Francisco Goya (1798) showing an infant being offered to the devil, who appears in the shape of a goat. (Wikimedia)

medicinal baths (Victor 1994). But the anti-Semitic version of the myth was widespread throughout the European Middle Ages. Geoffrey Chaucer recounted a version of the legend in *The Prioress's Tale*, one of *The Canterbury Tales* (ca. 1387 CE), and this myth, as well as other anti-Semitic ideas, led to the scapegoating and murder of Jews during times of plague (Atlani-Duault et al. 2015).

The European Witch Craze

The book *Malleus Maleficarum*, commonly translated as "Hammer of Witches," was written in 1487 by the Catholic clergyman Heinrich Kramer and the Dominican inquisitor James Sprenger. The *Malleus* became the manual for conducting witch trials, and it shaped popular ideas about the activities of witches. The women accused of witchcraft were often unmarried and frequently worked as midwives (Barstow 1994); among other horrors they were accused of murdering infants. Section XI of the *Malleus* includes the following passage: "Certain witches, against the instinct of human nature, and indeed against the nature of all beasts, with the possible exception of wolves, are in the habit of devouring and eating infant children" (Kramer and Sprenger 1487, 55).

The number of people killed in the witch craze is estimated to be between 60,000 and 100,000—overwhelmingly women (Barstow 1994). The last person killed as a result of a sanctioned witch trial is thought to have been Anna Göldi of the Swiss Canton of Glarus in 1782 (Foulkes 2007).

Satanic Ritual Abuse Scare

The 1980 bestselling book *Michelle Remembers* introduced the idea of Satanic ritual child abuse. The prior decade had seen the emergence of new religious movements, and people were worried about young people being attracted to cults. In late 1978, 900 followers of the Reverend Jim Jones killed themselves in a mass suicide poisoning in Guyana, an event that became known as the Jonestown massacre. In this cultural context, the toxic ideas promoted in *Michelle Remembers* took root and found their greatest expression in the McMartin Preschool case in Manhattanville, California, in 1983. Seven staff members at the McMartin Preschool were accused of having ritually abused 360 children as part of a "Devil-worship" cult (Victor 1994). The McMartin case—which was not resolved until 1990—was the longest and most expensive trial in U.S. history, and in the end neither of the main defendants, Peggy McMartin Buckey and her son Ray Buckey, were convicted of any crime.

Meanwhile, the fear of Satanic ritual abuse had been adopted by many social workers, psychologists, law enforcement officials, and religious leaders. Therapists often used hypnosis or suggestive interview methods to "recover" memories of child abuse in their adult clients. During that period, I knew therapists who went to special in-service training programs to learn about Satanic ritual abuse. But eventually, after the McMartins were found not guilty, skepticism about the phenomenon finally began to grow. Expert witnesses, including psychologist and CSI Fellow Elizabeth

Facilitated communication (YouTube)

Loftus, testified about the unreliable nature of recovered memories and the effects of leading questions on the testimony of young children.

In 1994, the *New York Times* summarized the key finding of an investigation conducted by psychologist Gail Goodman of the University of California Davis of over 12,000 accusations Satanic ritual abuse: "The survey found that there was not a single case where there was clear corroborating evidence for the most common accusation, that there was 'a well-organized intergenerational satanic cult, who sexually molested and tortured children in their homes or schools for years and committed a series of murders'" (Goleman 1994). The Satanic ritual abuse phenomenon was eventually recognized as a moral panic based on unreliable evidence (Haberman 2014).

Facilitated Communication

As readers of Skeptical Inquirer may recall, facilitated communication (FC) is a thoroughly discredited form of communication used with autistic children and others who are unable to use speech to communicate (Vyse 2015). The theory behind FC suggests that autism is a physical condition, not a cognitive one, and that many children are intellectually capable of language but lack the physical ability to speak or write. To overcome this difficulty, another person, a facilitator, holds the autistic person's hand, arm, or shoulder as they type on a keyboard. Unfortunately, all the controlled studies of this phenomenon have found that the communications are coming from the facilitator and not from the person with the language disability. In a phenomenon similar to a Ouija board, the facilitators are unaware of their influence over the typing (Boynton 2012). Despite the overwhelming evidence against FC, it remains popular with many parents and teachers of language-disabled people.

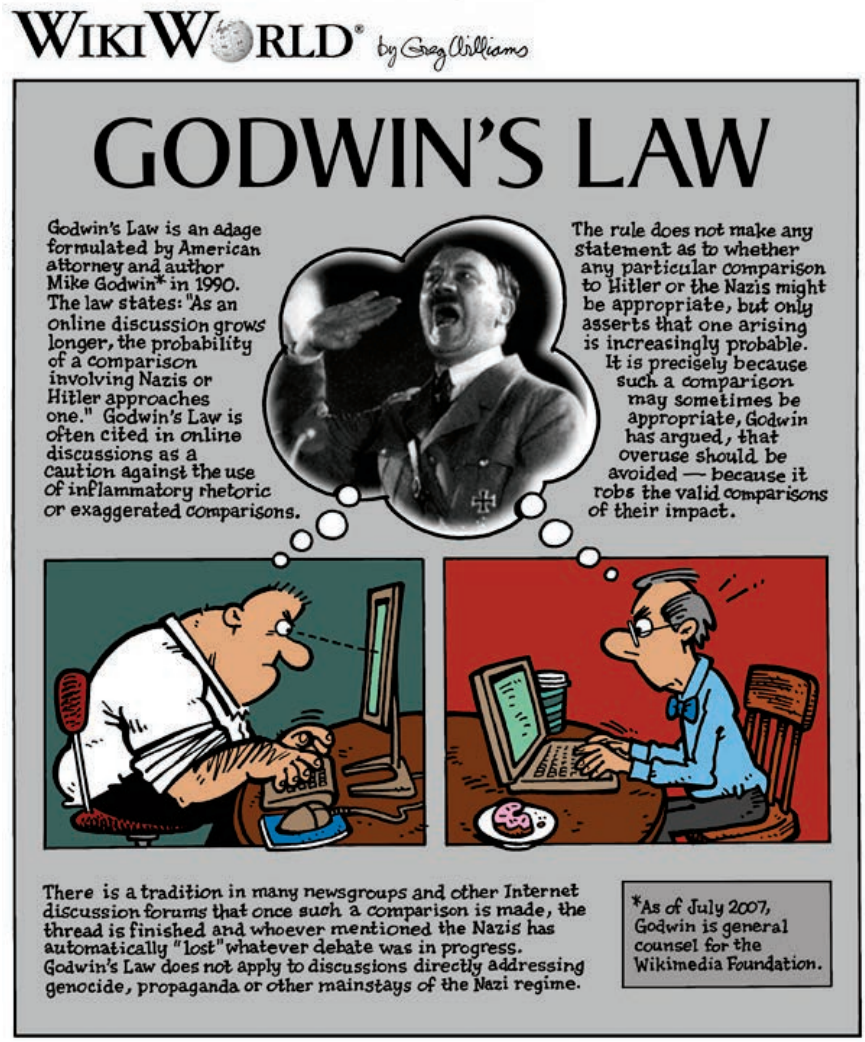
Part of the reason we know that facilitated communication doesn't work comes from the many accusations of child abuse that have been typed out using this technique. Beginning in the 1990s and continuing to the present day, families have been torn apart by these accusations, which law enforcement is forced to investigate. Although much damage has been done—and in some cases, parents have been jailed while the cases played out—all the accusations have eventually collapsed because it could not be established that the language-disabled individual was the author of the accusations. For a list of these false child abuse accusations, see the new facilitatedcommunication.org website established by a group of activists (including me) fighting to eliminate the use of the technique.

Pizzagate/QAnon

Today, the most popular form of child abuse moral panic comes from QAnon believers who are convinced that Democrats Joe Biden, Hillary Clinton, Barack Obama, and George Soros, as well as media figures Oprah Winfrey, Tom Hanks, Ellen DeGeneres, and others operate a global cabal of Satan-worshipping pedophiles (Roose 2020). The future of QAnon is unclear now that the message boards used by Q, the anonymous leader of the group, have been taken down. But the persistence of the pedophilia myth from Pizzagate to QAnon, combined with the results of the recent NPR/Ipsos poll, suggest that many people have latched on to this false belief as part of a highly charged political movement—a movement capable of getting some of its believers to storm the United States Capitol on January 6, 2021.

The Dangers of False Claims

Godwin's Law (Godwin 2017), a well-known internet principle, states that "as an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches one." Although not endorsed by Michael Godwin himself, some people have proposed a corollary to the original law suggesting that, when a comparison to Nazis or Hitler appears in an argument, the person making the reference automatically loses. Godwin's original suggestion was not that Hitler comparisons were never appropriate. Instead, his goal was to preserve these terms for appropriate use. In a 2015 op-ed in the *Washington Post*, he wrote: "The best way to prevent future holocausts, I believe, is not to forbear from


WIKIWORLD by Greg Williams
GODWIN'S LAW
Godwin's Law is an adage formulated by American attorney and author Mike Godwin* in 1990. The law states: "As an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches one." Godwin's Law is often cited in online discussions as a caution against the use of inflammatory rhetoric or exaggerated comparisons.
The rule does not make any statement as to whether any particular comparison to Hitler or the Nazis might be appropriate, but only asserts that one arising is increasingly probable. It is precisely because such a comparison may sometimes be appropriate, Godwin has argued, that overuse should be avoided — because it robs the valid comparisons of their impact.
There is a tradition in many newsgroups and other Internet discussion forums that once such a comparison is made, the thread is finished and whoever mentioned the Nazis has automatically "lost" whatever debate was in progress. Godwin's Law does not apply to discussions directly addressing genocide, propaganda or other mainstays of the Nazi regime.
*As of July 2007, Godwin is general counsel for the Wikimedia Foundation.
Text excerpted from the Wikipedia articles Godwin's Law and Mike Godwin.
Photograph of Adolf Hitler from Wikipedia image file "Image: Hitler speech.jpg" 10 September 2007

Source: Wikipedia

Holocaust comparisons; instead, it's to make sure that those comparisons are meaningful and substantive" (Godwin 2015). In 2017, he supported comparing the white supremacist protesters at Charlottesville, Virginia, to Nazis (Ohlheiser 2017).

I would like to propose a variation on Godwin's Law: "As a social movement becomes more emotionally charged, the probability that the opponents of that movement will be accused of child abuse approaches one." My motivations for framing the law are very similar to Godwin's. Child abuse in all its horrific forms is real; it happens. However, people who make false or unsubstantiated claims of child abuse weaken the force of the charge and make it less likely that justifiable claims of child abuse will be taken seriously. Paraphrasing Godwin, the best way to prevent the abuse of children is not to avoid all accusations; instead, it's to make sure that the accusations we make are meaningful and substantive. If we care about the welfare of children, we should be sure of the facts and not use them as pawns in our adult conflicts. ■

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[SKEPTICAL INQUIREE BENJAMIN RADFORD

Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry and author or coauthor of thirteen books, including *Big—If True: Adventures in Oddity*.

The Paranormal Wild West

Q: **Why doesn't the paranormal community police itself better when it comes to scientific rigor and fraud? In many areas—including ghosts, cryptozoology, and UFOs—it seems that pretty much anything goes.**

—B. Baker

A: This question hits on one of the key issues in critical analysis of mysterious and paranormal claims: Why—despite enormous amounts of time and effort over the course of decades with the benefit of increasingly sophisticated technology—is solid evidence of ghosts, Bigfoot, UFOs, psychic powers, and other such phenomena still conspicuously lacking? Paranormal proponents have long blamed others for their inability to provide good evidence. When conspiracy theorists, for example, are asked where proof of their claims is, they often roll their eyes and sputter that *of course* they can't provide evidence … because it's hidden by those in power; the fact that they don't have evidence of the coverup *is itself evidence* of the coverup.

The same happens in psychic research. Believers often resort to a special pleading fallacy called the "sheep/goat effect": When skeptics are watching, psychic powers inexplicably vanish, dim, or (in the context of lab experiments) drop to levels predicted by random chance. James "The Amazing" Randi, for example, was especially adept at blocking Uri Geller's psychic abilities by his mere presence, and demonic spirits seem to carefully avoid possessing or haunting skeptics.

Occam's razor suggests instead that Shakespeare was right: "The fault, dear Brutus, is not in our stars." If these phenomena are genuine, real, and amenable to verification—that is, not the product of myriad factors such as mistakes, perceptual and memory errors, hoaxes, misunderstandings, and so on—then there's no reason solid evidence shouldn't have been found by now. Researchers are simply incompetent and need to bring scientific rigor to the search, because what they've done so far has clearly failed.

Time and again conclusive evidence (of Bigfoot, extraterrestrial contact, psychic powers, etc.) is promised and fails to materialize, following a predictable pattern. First, a non-scientist or layperson claims to have discovered some important piece of evidence. News media then pick up the story, sensationalizing it in the process. Then, as public interest mounts, the original promoters promise that scientists will examine the evidence and prove their claims. You might think that the next step is that scientists examine the evidence and then hold a press conference to announce that the phenomenon has finally been verified.

But instead, the claims just fade away. Sometimes the evidence turns out to be hoaxed. More often the evidence is not faked but instead simply ambiguous and inconclusive. Nothing comes of the story because nothing can be determined from the evidence. It's just another footnoted failure in the annals of paranormal research, and few believers seem to notice that the footnotes greatly outnumber the text.

One serious problem is a lack of scientific rigor. To pick one notorious example, there is no consensus on what ghosts are—even among ghost hunters and self-proclaimed experts—and many of the explanations are mutually exclusive. A ghost cannot be *both* a sentient earthbound spirit *and* a hallucination; nor can a ghost be some sort of stored emotion (i.e., stone tape theory) *and* a malevolent, mischievous spirit. These theories must describe entirely different phenomena. If ghost experts don't have enough known, independently verifiable information about what they're studying to distinguish between a hallucination, a "time slip" from another reality, or a sentient spirit of the dead, the field is in far worse shape than anyone dared imagine.

There's no central authority making any attempt to hold evidence to any scientific evidential standard. In scientific research, there is some semblance of gatekeeping (imperfect as it is), partly because researchers are held professionally accountable for mistakes. For example, if the editor of a top medical journal publishes highly dubious (or even outright hoaxed) research, he or she can expect significant opprobrium, including calls to resign. There is no analogous position in Bigfootery, ghost hunting, or other paranormal research. A handful of journals attempt to impose some scholarly standards on the research, including the *Journal of the Society for Psychical Research* (1884–present) and *Cryptozoology: Interdisciplinary Journal of the International Society of Cryptozoology* (1982–1996). But most of what passes for paranormal research appears in blogs, New Age books, and social media posts with little or no quality control or outside input (much less skeptical commentary).

There is very rarely peer review in these fields, due partly to the prevalence of self-described experts (see my column "Paranormal Qualifications" in the November/December 2013 SI). Many paranormal "experts" are reluctant to openly challenge or criticize others for sloppy research and inflated or irrelevant credentials for fear of inviting the same scrutiny: "How dare you question my methods? I've been looking for Bigfoot for fifteen years and wrote a self-published book on it, while you were only a featured guest on Season 5 of *Finding Bigfoot*!"

The TV series *Ghost Hunters* was popular in part due to its alluring premise that anyone can be a ghost hunter. The two original stars were ordinary guys (plumbers, in fact) who decided to look for evidence of spirits. Their message: You don't need to be a scientist—or even have any training in science or investigation—to look for ghosts; all you need is some free time, a dark place, and a few cameras and gadgets. This message inspired tens of thousands of people to pursue paranormal "investigation" but failed to convey the caveat that *looking or hunting* for something isn't the same as scientifically *investigating* it. Basic principles of research design—so fundamental to basic science and valid results—are barely acknowledged in ghost hunting and other paranormal fields.

Mistakes, inconclusive evidence, and outright hoaxes are so routine in these fields that they're barely notable. It's only the occasional high-profile, extraordinary fiascoes that make national news and embarrass these fields (examples include the infamous alien autopsy hoax and Melba Ketchum's self-published "Bigfoot DNA" research, which had been rejected by scientific journals). For every one of these cases, there are hundreds of similar, lesser-known ones that rise up and fade away among the research communities. Proven hoaxers often circulate in these communities many years after their shoddy research and hoaxes were exposed. (I've heard Bigfoot researchers say, "Just because he faked one video doesn't mean his others aren't real.") Despite decades of this, the problem never seems to spur alarm or sufficient recognition among believers that their inability to police their field is fatal to their credibility and dooms their field to perpetual pseudoscience.

It's very frustrating to both skeptics and science-minded believers to have no quality control; it's a huge, self-imposed impediment that undermines the perpetual complaint that "scientists and skeptics won't look at the evidence." The fact is that scientists and skeptics do look at the evidence, but you have to provide them with good evidence. If you're making a claim—especially an extraordinary claim—then you need to offer good evidence for it. Generating spurious mysteries is very easy (an anonymous eyewitness sighting; a blurry photo or video of *something* in the sky or in a forest; an apparent "extra" face or body in a crowd, etc.) It's not the skeptics' job to sort through the mountains of mistakes and hoaxes to find any valid evidence. To return to the Wild West analogy, the citizens of Fortville need to organize and deputize themselves to keep out the con men and drunks instead of expecting the (often unpaid) skeptical sheriff to maintain order. ■

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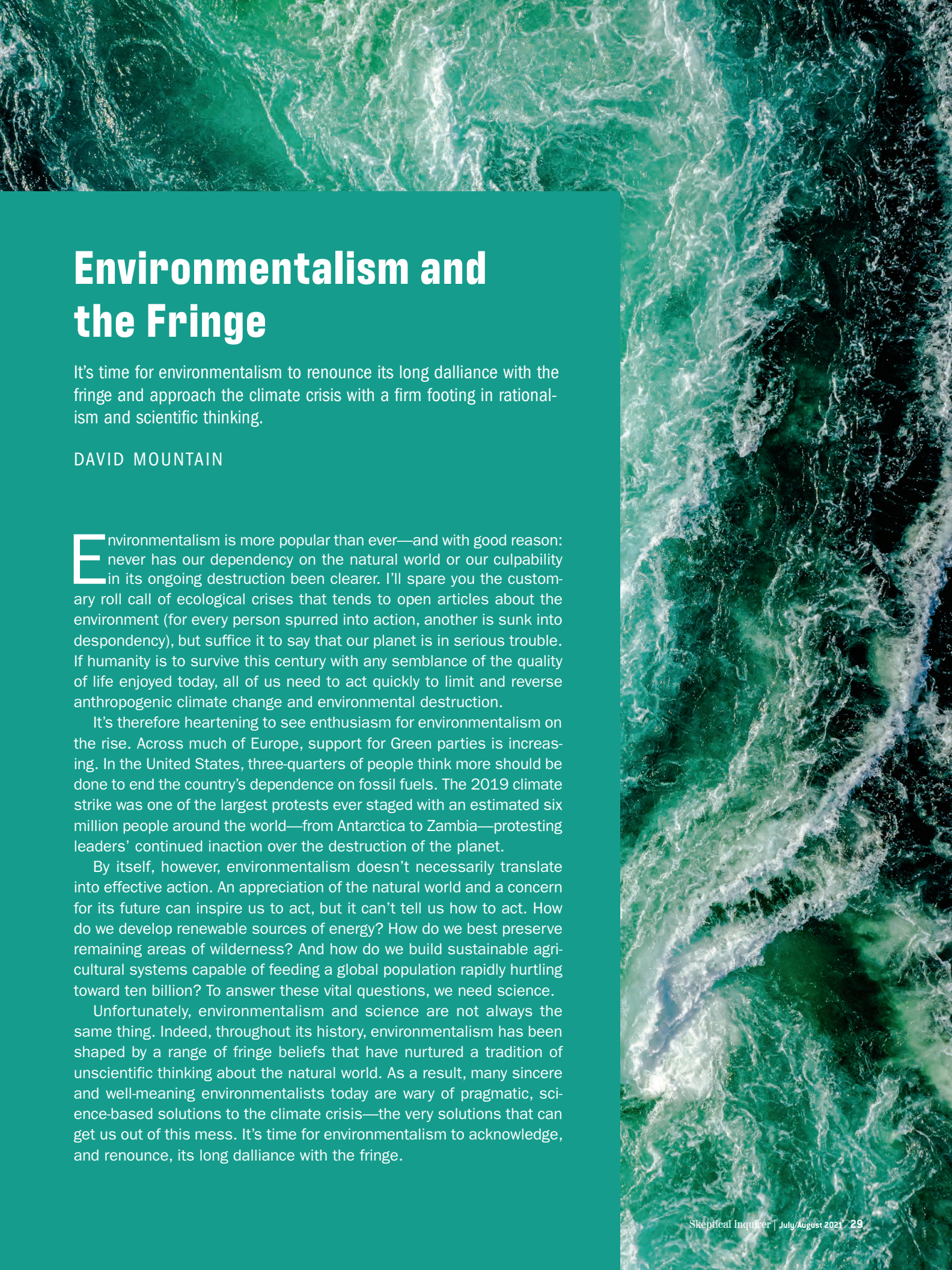

Environmentalism and the Fringe

It's time for environmentalism to renounce its long dalliance with the fringe and approach the climate crisis with a firm footing in rationalism and scientific thinking.

DAVID MOUNTAIN

Environmentalism is more popular than ever—and with good reason: never has our dependency on the natural world or our culpability in its ongoing destruction been clearer. I'll spare you the customary roll call of ecological crises that tends to open articles about the environment (for every person spurred into action, another is sunk into despondency), but suffice it to say that our planet is in serious trouble. If humanity is to survive this century with any semblance of the quality of life enjoyed today, all of us need to act quickly to limit and reverse anthropogenic climate change and environmental destruction.

It's therefore heartening to see enthusiasm for environmentalism on the rise. Across much of Europe, support for Green parties is increasing. In the United States, three-quarters of people think more should be done to end the country's dependence on fossil fuels. The 2019 climate strike was one of the largest protests ever staged with an estimated six million people around the world—from Antarctica to Zambia—protesting leaders' continued inaction over the destruction of the planet.

By itself, however, environmentalism doesn't necessarily translate into effective action. An appreciation of the natural world and a concern for its future can inspire us to act, but it can't tell us how to act. How do we develop renewable sources of energy? How do we best preserve remaining areas of wilderness? And how do we build sustainable agricultural systems capable of feeding a global population rapidly hurtling toward ten billion? To answer these vital questions, we need science.

Unfortunately, environmentalism and science are not always the same thing. Indeed, throughout its history, environmentalism has been shaped by a range of fringe beliefs that have nurtured a tradition of unscientific thinking about the natural world. As a result, many sincere and well-meaning environmentalists today are wary of pragmatic, science-based solutions to the climate crisis—the very solutions that can get us out of this mess. It's time for environmentalism to acknowledge, and renounce, its long dalliance with the fringe.

The Origins of Environmentalism

To understand why environmentalism has been so vulnerable to fringe influences, we need to travel back to the 1920s and the dawn of modern environmental awareness. In some ways, our planet was much healthier. The global population had yet to reach two billion. Atmospheric carbon dioxide was around 300 ppm, compared to 410 ppm today. Nevertheless, it was a world undergoing rapid and unsettling change. Cities were expanding at unprecedented speed. Industrialization was consuming natural resources at ever-greater rates. And it was a world still ringing with the echoes of the First World War.

The prospect of an increasingly mechanized and inhuman society heralded by these developments concerned many who lived through them. The ways in which people acted on these concerns, however, were very different. On the one hand, biologists and agronomists, worried about the rates of soil erosion and deforestation around the world, set about developing sustainable forestry practices, improved farming methods, and higher-yield crops, thereby laying the foundations for much of modern environmental and agricultural science (Barton 2018).

On the other hand, many artists and intellectuals, especially in Europe, sought not to address the challenges of the modern world but to reject modernity altogether. Fueled by nostalgia for a rural era that was rapidly being lost to the slums and smokestacks of urbanization, they attempted to recapture in some form a pre-industrial way of life. They championed traditional farming methods and outdoor living as the key to healthy, meaningful lives. They searched for worldviews that celebrated a spiritual connection with the natural world, from Hinduism to transcendentalism to paganism. And they constructed a farrago of unscientific philosophies they hoped would restore humanity's relationship with the environment.

Modern environmentalism is the heir to both these traditions: the scientific and pragmatic *and* the spiritual and nostalgic. However we choose to measure environmentalism's success—laws passed, acres protected, lives improved—the former has been to its merit; the latter, ultimately, has been to its detriment.

Life Force and Cow Dung

An early example of the spiritual approach to the environment was biodynamic farming, which dates back to 1924 when Austrian philosopher and self-declared psychic Rudolf Steiner gave a series of lectures in the German city of Breslau on a new discipline he called "anthroposophy." Steiner was interested in improving agricultural yields without damaging the environment. What he wasn't interested in was investigating this important cause with science or even basic logic. Anyone masochistic enough to read his lectures will find themselves swallowing an indigestible word salad. In a single sentence, Steiner appeals to astrology, radiation, ether, and the metabolism of cows to explain the workings of anthroposophy. Elsewhere, he discusses the imagined effects of cosmic forces, karma, and "moon rays" on the life force of plants and animals, which he believes are at the heart

of environmental and agricultural processes. Ultimately, Steiner argues—without a shred of evidence—that the earth is home to a range of mystical and magical forces and that agriculture can be revolutionized by harnessing these forces (Steiner 2007).

Steiner's lectures were a hit. Although he died just a few months later, a small but dedicated following continued his teachings under the new name of *biodynamics*. People were attracted to it for various reasons. Those wary of modern agricultural methods were drawn to its disdain for industrialization. Those left cold by the sterility and order of the modern world found comfort in its pseudo-pagan mysticism. In truth, there was nothing venerable about biodynamic farming. Despite his frequent allusions to ancient wisdom, Steiner invented his anthroposophical worldview entirely from scratch in the 1920s.

So how does biodynamic farming work? Well, in short, it doesn't. Biodynamic farmers attempt to enhance a farm's life force by applying potions, known as "preparations," to the soil, either directly or by mixing it into manure before spreading. These preparations are invariably concocted by subjecting natural substances to a series of bizarre, lengthy processes. One requires cow manure to be stuffed into a cow horn and then buried fifty centimeters underground for an entire winter. Another asks for a deer bladder to be bunged with yarrow blossoms and left out in the summer sun. And even if the resulting potions did somehow work, biodynamic farming guarantees its own uselessness by insisting that preparations should be applied in homeopathic amounts, with some processes asking for as little as one gram of potion per ten tons of manure (Dunning 2007). As Steiner himself confessed: "To our modern way of thinking, this all sounds quite insane" (qtd. in Barton 2018).

Flower Power

In the decades that followed, biodynamics' influence spread throughout Europe and North America. At the same time, others with an interest in agriculture and the environment also looked to the past—or, at least, an idealized imagining of the past—for direction. In the 1920s, a Swiss teacher named Hans Müller created the Swiss Farmer's Movement for Native Rural Culture, through which he expounded the benefits of pre-industrial farming techniques and peasant lifestyles. In the 1940s, the English folklorist Rolf Gardiner (later a founding member of the Soil Association, a prominent organic advocacy group) established the Kinship in Husbandry, a secretive organization with the aim of restoring rural ways of life in Britain. His acquaintance Gerard Wallop ran the English Mistery, a hyper-conservative group that hoped to revive feudalism in England. These various groups were united not just by nostalgia but a belief that there was more to the natural world than science could explain: something intimate, mystical, and unquantifiable (Reed 2010).

It wasn't until the 1960s and 1970s, however, that eco-spiritualism really took off. After all, this was the age of counterculture, a time when people throughout the West were looking for new and exciting things to believe in. As biologist Arthur Galston noted in 1972, a desire to reject "the synthetic, plastic world" of the establishment encouraged many to turn to nature for meaning and authenticity. Even his own students at Yale were attracted to this "anti-intellectualism," he glumly observed (Galston 1972).

Those looking to escape the establishment sought out any number of alternative beliefs. Some looked to Hinduism, Buddhism, and the Far East in the hopes of finding environmental philosophies uncontaminated by Western industrialism. Others turned to indigenous peoples such as Native Americans, who were said to retain an ancient spiritual connection with the natural world. Then there were those who looked to paganism for answers, reviving and reimagining nature-worship religions such as Wicca and Gaianism. Like biodynamics before, the resulting smorgasbord of beliefs was characterized by a desire to retrieve an older, more meaningful relationship with the earth and its ecosystems. In the words of one New Ager, it was about "regaining the intimate connection and awareness of our place in nature" (qtd. in Ferguson 1981).

Believers were typically motivated by a sincere concern for the environment. And their love of the esoteric didn't necessarily prevent them from participating in the practicalities of environmentalism. They could be found out in the Pacific Ocean, disrupting whale hunts; sitting in trees slated to be bulldozed by developers; or rustling up support for Earth Day in 1970, which proved a galvanizing moment for the environmental movement both in the United States and around the world. All too frequently, however, the spiritual dimension to their environmentalism fomented distrust of science and technology. To many counterculture environmentalists, these were part of the problem, not the solution. They represented, in the words of writer Edward Abbey, "the ever-expanding industrial megamachine" (qtd. in Drake 2013).

Take the neo-pagan movement. The emphasis on freedom and individuality makes New Age beliefs notoriously hard to generalize, but a representative sample of neo-pagans in the 1970s might have spent their free time growing organic vegetables, immersing themselves in nature, and attending group "apologies," in which they showed contrition to the earth for humanity's environmental destruction. Guided by the conviction that our planet is sacred, they also raised awareness of various environmental causes, including recycling, renewable energy, and the protection of wildlife refuges (Bloch 1998).

Campaigning and awareness-raising are of course good things. However, neo-paganism's suspicion of modernity all too often soured into a hostility toward mainstream society. Cities in particular were condemned as representing everything wrong with twentieth-century civilization. "If you look at [Earth] from space," explained one neo-pagan, "you'll see giant cancer cells called cities across the face of the planet" (qtd. in Bloch 1998). As a result, many neo-pagans were—and still are—wary of mainstream environmental efforts that are,

by definition, best placed to generate change.

Moreover, by combining environmental causes with spiritual beliefs, neo-pagans and their fellow New Agers tainted environmentalism for many in mainstream society who didn't share their interest in things such as astrology, reincarnation, and "sexual magic." The influence of fringe beliefs such as neo-paganism led to environmentalists, even those who approached the subject as a strictly scientific matter, being lampooned as tree-hugging hippies. This caricature not only dissuaded people from becoming environmentalists but allowed environmentalism itself to be dismissed as a fringe belief. It's taken decades for the movement to shake off the stigma and reassert itself as a global and urgent concern.

Rebellion, Inc.

Eventually, even tree-hugging hippies grow up, get jobs, and settle down. This is what happened to the baby boomers who had formed the vanguard of New Age environmentalism. By the 1990s, their generation had ascended to the positions of power they once scorned: they were now politicians, lawyers, and business owners. This isn't to say that they abandoned their beliefs once they joined the mainstream. On the contrary: although they no longer chained themselves to trees or boarded anti-whaling boats, they still carried their anti-establishment dreams with them. The only difference was that they now had the power and influence to enact them. Seemingly blind to the irony, counterculture became mainstream (Heath and Potter 2005).

This is why the 1990s mark the moment when previously radical environmental beliefs became widely accepted, further compounding environmentalism's relationship with the fringe. Organic produce began appearing on supermarket shelves, where it was marketed as the green choice for shoppers worried about the environment. Alternatively, the ethically minded could head to their local farmers' markets and buy locally grown produce. Even biodynamic farming achieved some mainstream acceptance: today biodynamic vineyards cover an estimated 11,000 hectares around the world. In terms of influencing contemporary environmentalism, the commercialization of fringe beliefs and practices in the 1990s was just as influential as the rise of counterculture movements some thirty years previously.

At the heart of this commercialization was the desire, undimmed since the 1920s, to escape the chemicals and corporations of modernity for an older, gentler relationship with the earth. Organic farms contrasted the human scale of their enterprises with the sprawling monocultures of industrial farming. Farmers' markets likewise peddled nostalgia for a time before sterile supermarkets and faceless production lines. It would be unfair and inaccurate to claim that organic farming or local produce are unscientific in the way that, say, biodynamics is. But their origins and subsequent success owe just as much, if not more, to the spiritual and nostalgic strain of environmentalism as they do to the scientific and pragmatic. Consequently, when environmentalists today encourage us to buy local and eat organic, they often find themselves at odds with more pragmatic and scientifically grounded approaches.

Let's stay with organics for a moment. In some ways, organic farming can indeed be very good for the environment. Organic farms can help maintain local biodiversity, for example, and their soils can store more carbon than those on non-organic farms. But organic farming isn't a viable solution to the problem of sustainable agriculture, at least for most people. This is because organic agriculture is less efficient than modern, industrial farming methods and therefore requires a greater amount of land—typically 40 percent more—to grow the same quantity of food as a non-organic farm. Remember that the global population is currently approaching eight billion and is forecast to reach ten billion by around 2060. There's simply not enough land on earth to feed that many people using organic methods—at least not without converting the planet's remaining wildernesses into farmland, with the loss of ever more habitats and species. Despite this, many environmentalists today continue to advocate organic produce as the only ethical choice for those concerned about the natural world.

What about locally produced food? The principle behind it seems like common sense: the fewer miles your food has traveled to reach your plate, the fewer greenhouse gases released during its transit. In some situations, this is indeed the case—but not always. When you factor in other variables affecting the environmental impact of food production—water use, growing methods, storage techniques, and so on—in many cases transport is no longer the most significant source of emissions. In 2006, a team from Lincoln University in New Zealand did just this and found that the dairy, lamb, and apple farming industries emit more carbon dioxide in the United Kingdom than in New Zealand. As bizarre as it may seem, for U.K.–based environmentalists like me, the green thing to do is therefore to buy apples imported from New Zealand rather than buy the locally grown alternatives (Saunders et al. 2006).

Perils of Nostalgia

It's time for environmentalists to reassess our relationship with the megamachine. The hope of escaping modernity for some rural idyll was a pipe dream even in the 1920s. Today it's deluded to the point of being dangerous. Like it or not, the world is either industrialized or industrializing and, short of something catastrophic, will remain so for the foreseeable future. Environmentalists, if we are serious about saving the planet, need to accept this. We need to abandon false hopes of subverting our industrialized, urbanized societies and instead think about how we can work with them to change them for the better. Earlier I described environmentalism as a movement of two halves: one scientific and pragmatic and the other spiritual and nostalgic. Over the past century, the latter has become increasingly self-defeating as it grows ever more out of touch with reality. The future of environmentalism must be grounded in science and pragmatism.

It's worth remembering that the megamachine doesn't just

destroy the natural world. Indeed, as science and technology get to grips with the scale of environmental crisis facing us, they are coming up with many ingenious solutions. Genetically modified crops have been developed that use 25 percent less water than their unmodified counterparts. State-of-the-art herbicides such as glyphosate improve crop yields while reducing costs, all without harming humans. Even nuclear power plants, once the supervillain of the environmental movement, have dramatically improved in terms of safety and reduced waste. In fact, a 2017 study found that the world will probably fail to meet the emissions targets set by the Paris Agreement without relying on nuclear power to some extent (Peters et al. 2017).

And yet, time and time again, we have witnessed the embarrassing spectacle of hazmat-clad Greenpeace activists ripping up genetically modified crops or of countries outlawing glyphosate on the basis of unfounded environmental concerns or of environmentalists simultaneously demanding that countries dramatically cut emissions while abandoning nuclear power. We have to contend with green activists regarding organic food as a matter of principle and not privilege or insisting that the solution to the climate crisis lies in the wholesale "decommercialization" of the West's "toxic economic system." This is the legacy of the environmental fringe.

The saving grace in all this is that these people mean well. Most share a sincere concern for the natural world. But as long as they continue to advocate solutions rooted in the nostalgia and spiritualism of the environmental fringe, they are hindering their own cause.

So keep the passion. Keep the compassion. But, for the earth's sake, drop the disdain for science. ■

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David Mountain is a freelance writer based in Edinburgh. He is the author of *Past Mistakes: How We Misinterpret History and Why It Matters* (Icon Books, 2020).

Ten Years of Fukushima Disinformation

Many still erroneously believe that those who fell victim to the giant Tōhoku earthquake—the largest ever to hit Japan—and subsequent devastating tsunami were victims of a 'nuclear disaster.' Here are some facts vs. the myths.

AMARDEO SARMA AND ANNA VERONIKA WENDLAND

March 11, 2021, marked the tenth anniversary of the 2011 Tōhoku earthquake, which, together with the tsunami it triggered, devastated the northeast coast of Japan's main island of Honshu and triggered the Fukushima nuclear accident.

However, it is Fukushima that has remained in public awareness. The event's memory is shaped mainly by unsubstantiated horror stories that have decisively influenced nuclear power debates. This article examines widespread myths about the events and contrasts them with the facts.

Consequences of the Tōhoku Earthquake and Tsunami

The earthquake was the largest to hit Japan and the fourth largest worldwide in recorded history. It and the subsequent tsunami cost between 15,000 and 20,000 lives.

The consequences, however, went far beyond the deaths. Half a million people fled (Choate 2011; McLaughlin 2016), and 300,000 people lost everything (The Hiroshima Syndrome 2014). Nearly 230,000 were still living as disaster refugees in 2015 (Shim 2015). In 2017, there were reportedly over 130,000 evacuees (Internal Displacement Monitoring Centre 2017), and in 2018 there were still nearly 60,000, including over 5,600 in emergency shelters (Hyakutake and Miyazaki 2018). In 2019, there were still 48,000 displaced persons ("The State of Recovery…" 2020). Add to that the mental health consequences: post-traumatic stress disorder (Wolters Kluwer Health 2017; Harada et al. 2015), increased suicide rates (Orui et al. 2018; Takebayashi et al. 2020), and stigmatization of Fukushima evacuees (Marcantuoni 2018; Karz et al. 2014).

Ten years later, the consequences of this disaster remain. In Japan, the nuclear accident is remembered merely as one—albeit particularly deplorable—aspect of the Tōhoku earthquake. In many parts of the world, Fukushima was taken as an occasion for an anti-nuclear mobilization push. Alongside Three Mile Island in 1979 and Chernobyl in 1986, Fukushima became the third world catastrophe of nuclear power.

In Germany and elsewhere, anti-nuclear activists successfully labeled the Tōhoku disaster as the "Fukushima disaster," conflating the earthquake and tsunami devastations with the consequences of the nuclear accident. The latter dominated the headlines this year while mainly ignoring the tsunami victims' fate and displaced persons. Many still erroneously believe that those who fell victim to the earthquake and tsunami were victims of a nuclear disaster.

The anniversary of the Tōhoku earthquake disaster has become Fukushima Memorial Day in Germany. Narratives about "Fukushima cancers," "uninhabitable regions," and

"radioactive water" disposal into the sea have amplified this perception, but the facts offer a different perspective.

The Facts about What Happened in Fukushima

In the early afternoon of March 11, the tsunami hit the Fukushima Daiichi nuclear power plant (Fukushima 1) in Ōkuma in Fukushima Prefecture. The utility Tokyo Electric Power Company (TEPCO) operated six boiling water reactor units that had gone online between 1971 and 1979.

Three of the six reactors were in operation at the time of the earthquake. They were automatically shut down after the earthquake hit by shooting the control rods into the reactor cores. Their residual heat removal systems started up as intended. Diesel-powered emergency generators had to take over the power supply to the units.

The subsequent tsunami wave flooded switchgear equipment, emergency diesel generators, and batteries housed in the Fukushima Daiichi basement. The flooding resulted in a complete loss of onsite power. As a consequence, both the residual heat removal systems and the instrumentation and control systems were unavailable. Crews had to operate in total darkness and received hardly any information about the plant's status. There were no elaborate emergency plans or emergency drills for such an eventuality; the staff had to improvise. Operators, power plant management, and emergency staff were not prepared for three beyond-design-basis accidents of this magnitude. Communication and transport routes were destroyed, and the supply of fuel reserves, evacuation equipment, emergency power and pump units, and food for the personnel was delayed (Eidgenössisches Nuklearsicherheitsinspektorat [ENSI] 2018).

There were no elaborate emergency plans or emergency drills for such an eventuality; the Fukushima staff had to improvise.

In units 1, 2 and 3, the reactors' residual decay heat could no longer be removed, which led to a core meltdown there. Besides, hydrogen gas was produced in the reactor systems due to the hydrolysis of coolant on the overheated zirconium cladding of the fuel elements, which escaped through leaks in the condensation chambers and the primary containments and accumulated in the upper floors of the reactor buildings. The hydrogen formed an explosive mixture with atmospheric oxygen, leading to hydrogen explosions in units 1 and 3 on March 12 and March 14. In the early morning of March 15, a hydrogen explosion also occurred in unit 4, which was not affected by the core meltdown because hydrogen gas was transported to this unit via common ventilation systems. It was not until the evening of March 15, more than four days after the accident began, that the cooling of the reactors could be stabilized. One week after the start of the accident, the external power supply was restored. The three damaged reactors achieved their "cold shutdown" status in December 2011 (ENSI 2011; Gesellschaft für Reaktorsicherheit [GRS] 2011).

Myths Surrounding Casualties and Their Causes

The molten fuel mass in units 1 to 3 of the Fukushima Daiichi nuclear power plant dripped in whole or in part from the damaged reactor pressure vessels onto the floor of the primary containment. There, it ate into the concrete structures and solidified. Thus most of the reactor inventory was held inside the containments, but leakage could no longer be prevented due to the earthquake and explosion damage and the late initiation of pressure relief. Controlled but unfiltered ventings also released large quantities of volatile radionuclides.

The full release of iodine-131, caesium-137, and cesium-134 is estimated at 3.7×10^{17} becquerels (Bq) of iodine equivalent, about one-tenth of the release in the Chernobyl accident. Nevertheless, like Chernobyl, Fukushima was classified at Level 7 (release $>5 \times 10^{16}$ Bq) on the International Nuclear and Radiological Event Scale (INES). Unlike with Chernobyl, no one at the power plant died from radiation over-exposure. As of October 2011, a total of 388 people received radiation doses above the 20 millisieverts (mSv) permitted annually for occupationally exposed persons. Fourteen people received more than 100 mSv. To date, there is one case of fatal lung cancer that has been officially recognized as an occupational disease, but it is implausible to have resulted from the accident itself (GRS 2016).

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimated that the expected number of premature deaths from cancer among nuclear workers would be so small as to be statistically insignificant. No casualties were expected among the civilian population that was evacuated in time (United Nations Scientific Committee on the Effects of Atomic Radiation 2014).

The nuclear accident itself did not cause any direct radiation-related deaths. Instead, the fatalities at and close to the nuclear power plant's site are due to the earthquake and tsunami and the evacuation measures taken after the nuclear accident.

Facts about the Indirect Consequences of the Fukushima Accident

The evacuations claimed between 1,000 and 1,600 lives. The official website of Fukushima Prefecture lists 2,238 disaster-related deaths (as of June 2018) (Fukushima Revitalization Station 2019) where not all were evacuated because of radiation. The newspaper *Tokyo Shimbun* (Japan for Sustainability 2016) counted 1,368 deaths due to evacuations in July 2016. Many older people died due to evacuation. Others committed suicide due to their not coming to terms with their dislocation.

The nuclear accident itself did not cause any direct radiation-related deaths.

Were the evacuations necessary to protect the population from high radiation exposure? Scientific studies paint a sober picture. The editorial of a whole series of studies concludes that the radiation's health consequences may have been significantly overestimated (Thomas and May 2017).

These studies are based on the controversial LNT (linear no-threshold), a mathematical risk model that has been used since the 1920s to predict the effects of radiation. It establishes a linear relationship between radiation dose and the development of cancer in tissue. There is no threshold value in this model, so it assumes that even the smallest quantity of radiation can cause cancer. It should be briefly mentioned that this model is used in practice as a precautionary measure because of the uncertainty involved. The idea is to prevent conceivable, though not proven, damages caused by radiation even at low doses.

Jeanne Goldberg criticized the model in her article "The Spectral to the Spectrum: Radiation in the Crosshairs" in this magazine (Goldberg 2018). Beyond that, misusing the model to predict possible deaths based on hundreds of millions of people receiving minimal radiation exposure is scientifically untenable.

The editorial in the series of studies mentioned earlier summarizes the findings of the paper on relocation measures:

> Based on the Judgement- or J-value method, between 5 and 10 times too many people were moved away from the Chernobyl area between 1986 and 1990, and the authors find it difficult to justify moving anyone away from Fukushima Daiichi on grounds of radiological protection. (Waddington et al. 2017)

The misjudgment of the consequences of the nuclear accident, both in terms of evacuations and the decision to phase out nuclear energy, has been demonstrably damaging. It is important to note that the Japanese authorities could not have decided otherwise in March 2011: after all, it is precisely the characteristic of an acute crisis that decisions have to be made under uncertainty, lack of information, and pressure to act (Brinks et al. 2017).

Abandoned emergency shelter for evacuated families. Photo by Amardeo Sarma.

The authorities were bound by legal requirements and strict limits for evacuations; they had to act quickly because of the power plant's containment venting. At the time of the evacuation, it was unclear whether the power plant's situation would deteriorate. Radioactive releases could have become more extensive and weather conditions less favorable. But the subsequent decision to reopen large parts of the affected areas, based on careful assessment without time pressure, was justified.

The Myths of Death, Cancer, and Contamination through Fukushima

After the accident, a publication by Mark Z. Jacobson, a renewable energy researcher and staunch opponent of nuclear power, caused a stir. He claimed that there were about 130 (between fifteen and 1,100) cancer-related deaths and 180 (between twenty-four and 1,800) cancer-related illnesses due to Fukushima (Hoeve and Jacobson 2012). His paper is also based on the controversial LNT model. Even the smallest increases in radiation dose in remote regions of the world, such as the west coast of the United States, were included in the calculations.

But even those numbers pale compared to deaths from just about all other uses of technology by humans. Mark Lynas calls the publication "junk science":

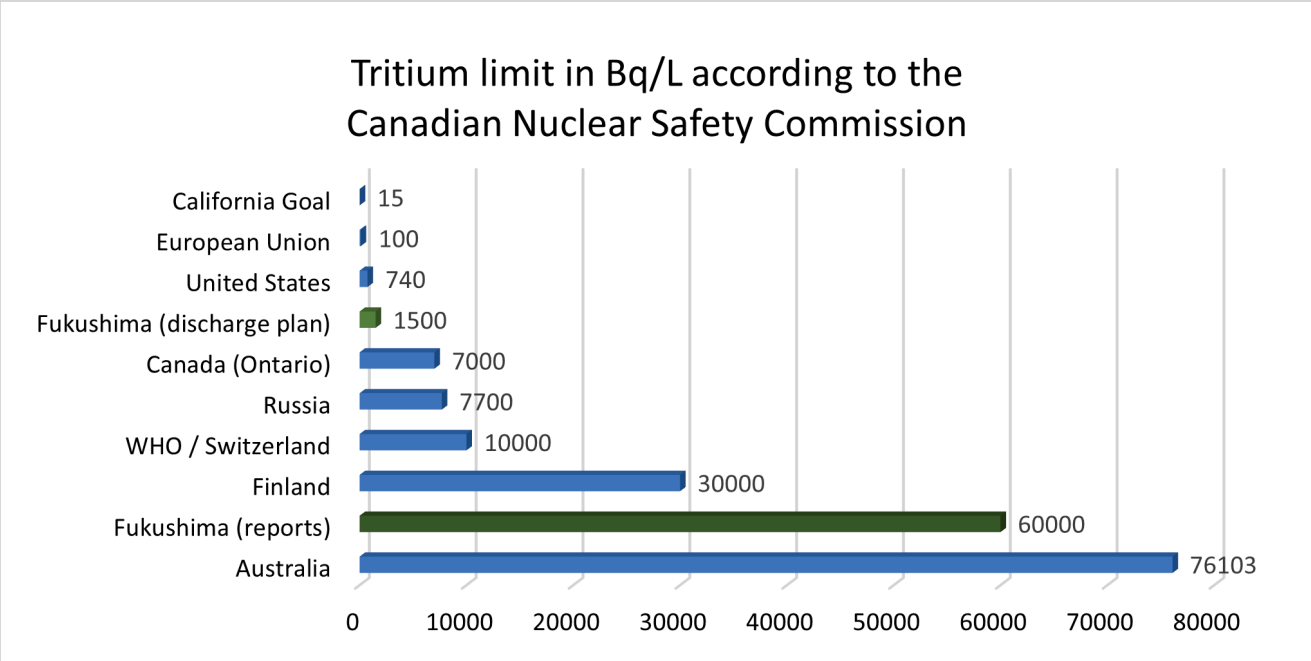
> In this deeply flawed paper, he succeeds only in illustrating some of the absurdities in current radiological protection models, and that one thing we know for sure—even if those absurdities are ignored—is that the evacuation killed more people than the accident. (Lynas 2012)

The World Health Organization concurred:

> Outside the geographical areas most affected by radiation, even in locations within Fukushima prefecture, the predicted risks remain low, and no observable increases in cancer above natural variation in baseline rates are anticipated. (World Health Organization 2013)

Thyroid Cancer among Children

Thyroid cancer is the only form of cancer that has a proven link to nuclear reactor accidents. Human thyroid glands take up the volatile radioiodine formed during nuclear fission and released during a meltdown. This particular problem is more significant in iodine-deficient areas. The half-life of iodine-131 is only eight days; the dose rate is high because of this. To avoid radioiodine uptake, affected persons must take potassium iodide tablets early and avoid contaminated dairy products. In the first days of the accident, a lot depends on functioning medical care, health education, and food substitution. After the Chernobyl accident, where these three conditions were barely met, over 1,000 children developed



Graphics by Amardeo Sarma from data by the Canadian Nuclear Safety Commission (2009).

thyroid cancer from the increased radiation.

Fukushima also reported an increased incidence of thyroid cancer in children after the reactor accident. An evaluation of various reports related to the much lower radiation exposure at Fukushima from international organizations concluded that it was difficult to link thyroid cancer to radiation exposure (Yamashita et al. 2018). Children had been overtreated, it said. According to this publication, distorted risk perception becomes a social problem, generates fear, and leads to psychological and mental consequences for those affected.

Fukushima Water

Reports about "contaminated" (implying contaminated with radioactive tritium) water in the tanks of the ruins of the Fukushima Daiichi power plant keep coming in. The water is stored in many tanks whose capacities are gradually running out. Experts recommended discharging it into the sea.

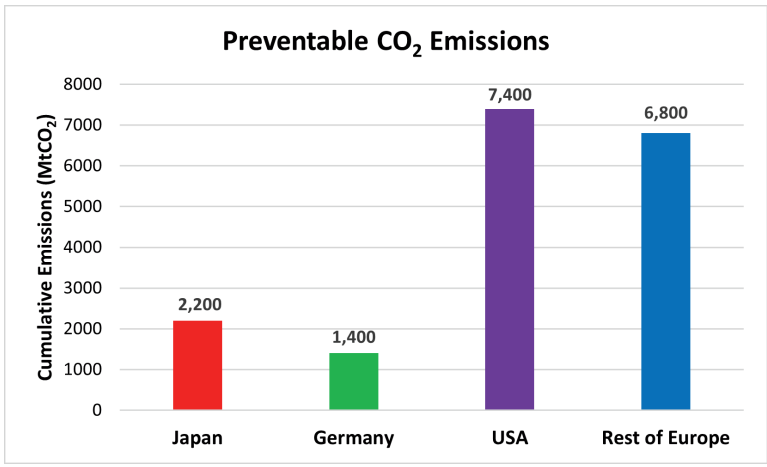
The concerns of residents and fishers are well-founded. If their fish are considered "contaminated," their income is at stake. This contamination is mainly caused by radioactive tritium, a hydrogen isotope. Tritium is not toxic; it is a beta radiation emitter with a half-life of 12.32 years, a weak emitter with low radiation levels. The storage water is the end-product of a complex filtering and evaporating procedure that removes most radionuclides from the reactor coolant and decontamination water. As a hydrogen isotope in water molecules, tritium cannot be removed by this process.

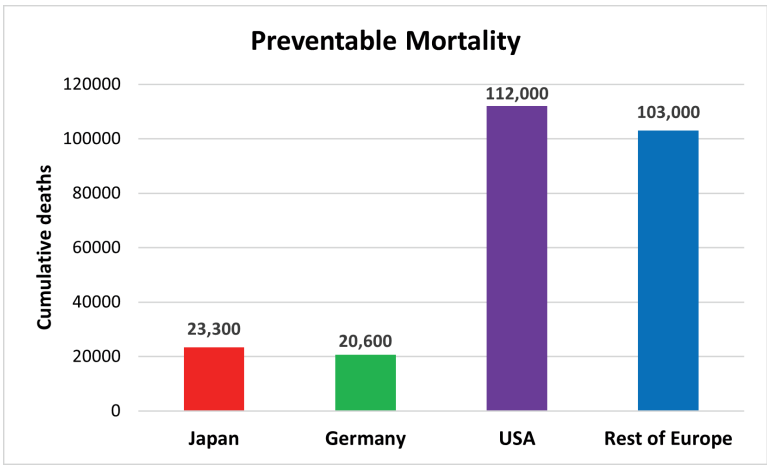
The graph above relates the tritium concentration to biological effects and limits.

Reports in Germany claimed that 770,000 tons of "radiating liquid" were planned to be discharged into the sea (Dambeck 2017). As a reality check, we only need to compare the 60,000 becquerels of tritium per liter of Fukushima water mentioned with the WHO guideline of 10,000 becquerels for drinking water.

The same graph shows that water with the Fukushima concentration of tritium reported in the media could be offered as drinking water in Australia (Canadian Nuclear Safety Commission 2009). Current plans foresee a dilution with sea water to at most 1,500 Bq/L before disposal, down to well below WHO levels (TEPCO 2020). In the ocean, the water would be diluted to a few Bq/L and thus pose no danger to fish or the ecosystem (Brown 2018).

A Canadian publication also criticized the repeated demands to lower the limits for tritium because the current limits are more than sufficient (Dingwall et al. 2011). Reductions give a false impression that the current limits do not offer any safety. If they are then increased to more reasonable values





by the authorities, as was the case after the reactor accident, this understandably arouses mistrust among some observers. However, there may be a conflict of interest here. One of the authors of the Canadian publication has ties to Bruce Power, an energy company operating CANDU deuterium uranium reactors that have relatively large tritium emissions compared to light water reactors.

Germany: Consequences of Nuclear Phaseout

In March 2011, the German anti-nuclear mobilization caused an abrupt turnaround in the Christian Democrate Party-Liberal Party coalition's energy policy. The party had previously decided to extend German nuclear power plants' lifetime, which the anti-nuclear movement saw as a severe defeat, but the party backed down from that previous decision. The government shifted completely away from terming nuclear energy as a climate-friendly "bridge technology" until renewable energy systems could take over, which used to be the favorite argument of Chancellor Angela Merkel, a physicist.

Merkel was genuinely shocked by the Japanese nuclear accident because now, unlike in Soviet Chernobyl, it had hit a Western capitalist high-tech society. Without reliable information on the accident's root causes, Merkel and her cabinet wrongly concluded that a similar accident could occur in German plants, and within three days they decided to phase out of nuclear power. Eight older German nuclear power plant units had their operating licenses immediately revoked. The remaining more modern plants were given a grace period of about a decade. In June 2011, the nuclear phaseout was approved by a broad cross-party majority in the Bundestag. An "ethics commission" made up of scientists, industrialists, NGOs, trade unions, and church representatives appointed by the Chancellor's Office—but including no experts in nuclear technology—provided catch-up legitimacy for this decision. To a large extent, all these decisions were made long before valid information was available about the Fukushima accident's causes. At no stage did the concerned check whether the conditions in Fukushima applied to German nuclear power plants.

The decision to phase out was never investigated in an evidence-based manner. The German reactor safety commission (RSK) stated that Fukushima could not be applied to German nuclear power plants, but the commission was ignored (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2020). German nuclear power plants are equipped with two redundant emergency power systems, hydrogen recombinators, and filtered containment venting systems. Vital systems and switchgear equipment are situated in flood-proof rooms. German nuclear power plant design considers the maximum 10,000-year flood event, whereas TEPCO considered only the maximum 100-year event. A German nuclear power plant at Fukushima's shoreside most probably would have withstood the tsunami thanks to its robustness (Die Bundeskanzlerin N.d.; Ethik-Kommission Sichere Energieversorgung 2011).

What were the consequences of Germany's phaseout of nuclear energy? Pushker A. Kharecha and Makiko Sato (2019a; 2019b) show the results using hypothetical scenarios. They found that Japan and Germany could have prevented about 28,000 premature deaths between 2011 and 2017 if they had phased out coal instead of nuclear power. These consequences were avoidable.

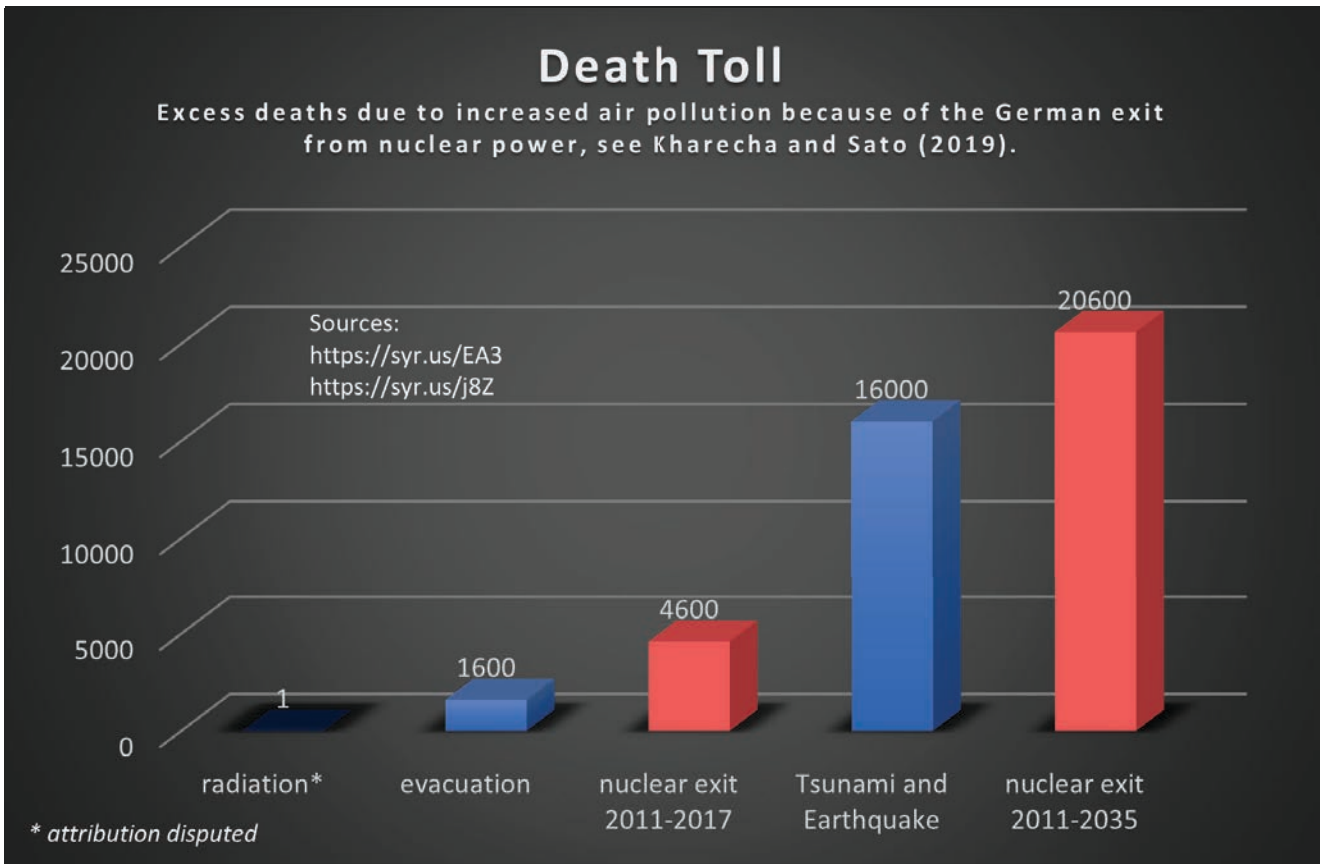
Thus, the shutdown of German nuclear power plants since 2011 resulted in about 300 deaths per year from particulate matter for every 1.5 GW of nuclear power lost, because nuclear power plants cannot be replaced entirely by renewable energy. The incredibly high number of over 100,000 deaths for the United States and the rest of Europe reflect the potential consequences if the involved countries would adopt a German-style nuclear phaseout linearly between 2018 and 2035.

Getting Serious about Climate Change

With severe consequences looming due to climate change, as Mark Lynas has shown in the timely new edition of his book *Six Degrees—Our Final Warning*, it is imperative that we use all available means for mitigation and adaptation (Lynas 2020). Mitigation requires us to come to a serious review of all low-carbon energy sources, including nuclear power, carbon capture and storage (CCS), bioenergy with carbon capture and storage (BECCS), in addition to renewable energy that itself is more than just wind and solar. All forms of energy generation come with their benefits and side effects. There is no free lunch.

The choices among the energy sources calls for a fact- and reality-based evaluation of all low-carbon energy benefits and side effects, neither exaggerating nor downplaying either based on political or tribal preferences. While clearly understanding the threat of global warming, the Biden administration appears more open to solutions outside the 100 percent renewable camp. It would be good to see the United States in the driver's seat again, this time not bound by old dogmas. Keeping working and safe nuclear power plants running and investing in all low-carbon energy technologies will be critical.

It should be kept in mind that the IPCC Special Re-



port on the impacts of global warming of 1.5 (deg) C above pre-industrial levels includes all low-cabon energy sources, including nuclear energy in all its four scenarios. It is deplorable to see many climate activists completely ignoring the IPCC when its summary of the world's research does not suit their partisan solutions.

Conclusion

We classify the Fukushima accident as a serious industrial accident. However, the actual consequences pale against the background of the more severe destruction and casualty figures of the natural disaster. Fukushima was not the global catastrophe it is often made out to be. Tōhoku was one of the most severe national disasters in recent history for Japan. Measures must do more good than harm in this regard. The data strongly suggest that measures in Germany (and, in retrospect, Japan) were not appropriate. Governments worldwide should carefully analyze the Japanese accident to learn how their nuclear power plants can be better prepared for future accidents and learn from Japan's experience. It is imperative to weigh the negative consequences of phasing out versus the benefits of keeping each nuclear power plant. Governments and public authorities are well-advised to make their decisions based on science and facts rather than following popular narratives. ■

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Amardeo Sarma is an electrical engineer, a fellow and member of the Executive Council of the Committee for Skeptical Inquiry, and a Skeptical Inquirer editorial board member. He is the founder and chairman of the German skeptics organization GWUP. He has spoken on global warming and its consequences as well as mitigation measures since 2014. Sarma has been involved in industrial research for forty years and is currently general manager at NEC Research Laboratories Europe GmbH. Image credit: Evelin Frerk.

Dr. Anna Veronika Wendland is a specialist in East European history and in Science, Technology and Society Studies, Industrial Anthropology, and Eastern European History at the Collaborative Research Center SFB-TRR 138 "Dynamics of Security." She is also at the Herder Institute for Historical Research on East-Central Europe in Marburg, Germany. She recently completed a monograph on nuclear cities, nuclear work, and the comparative history of nuclear safety cultures. She conducted several long-term field studies at nuclear power plants in Eastern Europe and Germany for her research. Image credit: Petersburger Dialog.

‘Don’t Trust That Scientist!’

Research reveals there are many *ad hominem* attacks on websites covering science issues. The websites consistent with mainstream science employ the attacks differently from those that are not.

RALPH BARNES AND SAMUEL DRAZNIN-NAGY

Several activities are part of the scientific endeavor. Scientific activities obviously include things such as generating theories, gathering empirical data, and testing hypotheses. However, scientists also communicate their research to scientists and the general public. Scientists try to convince other scientists and the general public of the truth of their claims, but non-scientists also take part in science communication. Journalists and members of the general public, for example, often engage in science communication. Much of science communication doesn’t push an agenda. For instance, a communicator might simply want to inform people of the evidence and various theories related to a certain topic. What we are interested in are persuasive messages in science—those designed to persuade people that a particular scientific perspective is the correct one.

Persuasive messages about science can be consistent or inconsistent with the scientific mainstream. A scientist promoting the idea that global climate change is real (and influenced by human activities) would be promoting a message consistent with the scientific mainstream. In contrast, a blogger who promotes the idea that vaccines for COVID-19 contain microchips that will allow governments to track the recipients’ movements would be promoting a message inconsistent with the mainstream. For several years, we have been looking at persuasive argumentation related to science issues and particularly at differences between how those promoting claims inconsistent with the scientific mainstream differ from those promoting claims that are consistent with the scientific mainstream.

We should note that claims that are inconsistent with the scientific mainstream are not necessarily false; humans are imperfect, and as long as science is a human endeavor, mistakes are going to be made. Nonetheless, differences between those who agree with and those who disagree with mainstream scientific ideas may be of interest in their own right. Ralph Barnes and Rebecca Church (2013) compared websites that argued for evolution with those that argued for creationist views. They found that those that argued for evolution tended to frame the issue in terms of the weight of evidence, while those arguing for creationism tended to frame the issue in terms of certainty and proof.

Persuasive messages about science can be consistent or inconsistent with the scientific mainstream.

Creationist authors—but not those promoting evolution—tended to claim that they had indisputable “proof” for their claims. Ralph Barnes, Rebecca Church, and Samuel Draznin-Nagy (2017) also compared websites arguing for evolution with those arguing for the creationist perspective. They found that websites arguing for evolution relied primarily on

Table 1: Initial *Ad Hominem* Rubric

Type	Brief Description
Expertise/credentials	Attack on data/claim because the source lacks expertise or has been formally disavowed by some institution
Emotions/passion	Attack on data/claim because the source is emotional or blinded by passion
Ethics/character	Attack on data/claim because the source is unethical or of bad character
Intelligence/bad thinking processes	Attack on data/claim because of the way the source thinks or doesn't think (e.g. stupid, close-minded, ignorant)
Financial interest	Attack on data/claim because source has a vested financial interest
Appeal to negative non-financial motivations	Attack on data/claim because motives of the source are bad for non-financial reasons
Association with bad people/groups	Attack on data/claim because the source is a member of an organization that is known to be bad or because the source associates with people known to be bad
Generic abusive	Attack on data/claim because the source is bad in a vague/generic sense (e.g., a jerk)
Bad action	Attack on data/claim because the source engaged in a bad action
Other negative qualities	An attack on data/claim because of something negative about the source, but it doesn't fit into any other categories above

arguments from empirical evidence. In contrast, creationist websites used a wide range of argumentation, including appeal to authority and appeal to reason.

Furthermore, evolution websites differed from creationist ones in the topics they addressed. Most arguments on the websites arguing for evolution were narrowly focused on descent with modification. In contrast, arguments on the websites arguing for creationism tackled a larger range of topics, including whether or not God exists, the age of the universe, and whether or not the biblical creation story is true. In the conclusion of their 2017 article, Barnes, Church, and Draznin-Nagy, suggested that it would be worth examining other scientific issues (e.g., AIDS denialism, global warming, and vaccine safety) to see if the differences between those arguing for mainstream and non-mainstream science views were unique to the topic of origins or whether they extended to other science issues.

The argument of central concern for the current study is the *ad hominem* argument or *ad hominem* attack. An *ad hominem attack* may be defined as an argument directed not at the substance of an argument but at the individual promoting that argument. An example of an *ad hominem* attack would be attempting to undermine Andrew Wakefield's claim that the MMR vaccine causes autism-like symptoms in children by noting that his medical license has been revoked. In contrast, an argument directly targeting Wakefield's claims might focus

Table 2. Rubric for *Ad Hominem* Attacks Focused on the Action of the Communicator

Type	Brief Description
Harm	Action causes physical or psychological harm to people, animals, or environment
Information control	An action related to information control (e.g., lying, withholding information)
Money	Controlling money in some way (e.g., funding/defunding research)
Other	An action that doesn't fit into the above three categories

on the small sample size, inaccurate data reporting, and lack of replication of Wakefield's now-retracted *Lancet* article.

In the past, *ad hominem* attacks were often assumed to be fallacious and unreasonable. However, many scholars today feel that *ad hominem* attacks may be reasonable or not depending on how they are used (Aberdein 2014; Walton 1998). An unreasonable *ad hominem* argument might include this example: evolution is a lie because a scientist who claims that evolution is true is an atheist. An example of a reasonable *ad hominem* argument might be this: a scientist's claim that smoking poses no health risk should be viewed with a healthy dose of skepticism because the scientist is an employee of the tobacco industry. Whether reasonable or unreasonable, there is empirical evidence that *ad hominem* attacks can be very influential (Barnes et al. 2018; Kaid and Boydston 2009; Yap 2013).

The Study

Along with our colleague Zoë Neumann, we looked at four science issues: AIDS denialism, climate change, GMO safety, and vaccine safety. An *inconsistent* website had to be arguing for one of the following four claims: 1) HIV does not cause AIDS; 2) global climate change is not occurring and/or is not due to human actions; 3) GMOs are not safe; or 4) the health risks of vaccines (e.g., autism) outweigh the benefits. A *consistent* website had to be arguing the converse of any of the aforementioned four claims. To select websites that contained either arguments for or against the mainstream scientific view on all four of these topics, we used a Google search strategy that was very similar to the one we had used in an earlier study (Barnes et al. 2017). All the websites we chose presented lists of arguments for a view that was either consistent with or inconsistent with the mainstream scientific view of each issue. We ultimately selected sixty-nine websites for our analysis (11, 28, 15, and 15 respectively for the topics of AIDS denialism, climate change, GMO safety, and vaccine safety; see Barnes et al. 2020).

Once we selected the websites to be analyzed, we then had to identify all examples of *ad hominem* attacks. Once those arguments were located, our next job was to develop a rubric for identifying the particular focus of each *ad hominem* attack. To this end, we developed two rubrics. We first categorized all *ad hominem* attacks (see Table 1). If an argument was initially categorized as "Bad action" in Table 1, we then more narrowly categorized the argument using the rubric presented in Table 2.

All arguments were independently coded by two individuals on the basis of the rubrics found in Tables 1 and 2. The results based on the initial rubric can be found in Table 3. We found that websites promoting views that were inconsistent with the scientific mainstream were more likely to use *ad hominem* arguments. This difference was driven primarily by the fact that the websites that promoted ideas inconsistent with the scientific mainstream were much more likely to accuse their opponents of engaging in bad actions. The results based on the action rubric (Table 2) can be found in Table 4. Our data reveal that the most popular type of negative action the opponents were accused of was information control. Readers who are interested in the raw data and a more detailed summary of the results of this study (e.g., results presented separately for each of the four topics) may consult the text and supplementary materials of the original article (Barnes et al. 2020).

Discussion

Our study found hundreds of examples of *ad hominem* attacks, both in documents arguing for and against the

Table 3. Frequencies from the Negative Appeals to Source Qualities Rubric as Function of Relationship to the Scientific Mainstream Position

Category	Consistent	Inconsistent
Expertise/credentials	14 (2.3)	1 (.3)
Emotions/passion	10 (1.6)	11 (3.3)
Ethics/character	1 (.2)	13 (3.9)
Intelligence/bad thought processes	40 (6.5)	28 (8.3)
Financial interest	33 (5.4)	22 (6.6)
Appeal to negative non-financial motivations	10 (1.6)	25 (7.5)
Association with bad people/groups	0 (0)	2 (.6)
Bad action	79 (12.9)	189 (56.4)
Generic abusive	14 (2.3)	20 (6)
Other negative qualities	47 (7.7)	50 (14.9)
Total appeals to negative qualities	248 (40.6)	361 (107.6)

Frequency per 10,000 words is shown in parentheses.

Table 4. Frequencies from the Appeals to Negative Actions Rubric as a Function of Relationship to the Scientific Mainstream Position

Category	Consistent	Inconsistent
Harm	5 (.8)	24 (7.1)
Information control	62 (10.1)	139 (41.4)
Money	2 (.3)	2 (.6)
Other	7 (1.14)	22 (6.6)
Total	76 (12.4)	187 (55.8)

Frequency per 10,000 words is shown in parentheses.

mainstream science perspective. The results of the present study are consistent with those of earlier studies conducted by Barnes and Church (2013) and Barnes, Church, and Draznin-Nagy (2017). Those earlier studies revealed that those arguing for the position that was inconsistent with the scientific mainstream (i.e., creationism) employed an argumentative strategy quite different from the argumentative strategy used by the websites promoting ideas consistent with the scientific mainstream (i.e., evolution). In this study, the differences in argumentation strategy between those arguing for or against the scientific mainstream are shown to extend beyond the issue of the origin of species. We now have evidence that a different pattern of argumentation based on perspective (i.e., consistent/inconsistent with the scientific mainstream) extends to four additional issues: AIDS denialism, climate change, GMO safety, and vaccine safety.

Many scholars in the field of argumentation science feel that abusive *ad hominem* attacks are often unreasonable and inappropriate (van Eemeren et al. 2009). If the authors of the websites in our sample agreed with this sentiment and/or felt that their audiences would not be persuaded by abusive *ad hominem* arguments, then we would predict that abusive *ad hominem* attacks would be relatively rare. The low frequency of the generic abusive attacks (see Table 3) bears this out.

In our Bad Action rubric (Table 2), one can see that the category of "information control" includes such things as lying and withholding information. We feel that pointing out an action such as dishonesty is a reasonable *ad hominem* attack. If an individual is known to have repeatedly lied about a science issue in the past, then it seems that it is quite sensible that we *ought* to be skeptical of science claims that individual may make in the future. For this reason, it may be no surprise that information control is the most common bad action that scientists are accused of.

When trying to understand what people choose to believe about science issues, we have to be aware that belief is about more than just facts. A wealth of research indicates that trust in sources is at least as important as the scientific facts when it comes to influencing the public (Slovic 1993; Slovic et al. 1991). This study reveals that those who get their science information from the internet may be exposed to a lot of negative information about the individuals making science claims. Why is trust in sources so influential when it comes to science claims? In light of the results presented here, the answer to that question might be that the public has been provided with many reasons to distrust certain sources of science information. Perhaps one reason that anti-vaxxers, climate change denialists, and creationists reject the mainstream science views on those issues is that they have been told that the mainstream scientists are not to be trusted. ■

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Ralph Barnes is an educator and researcher. His research interests include reasoning, judgment and decision making, and rhetoric. He earned his PhD from The Ohio State University and is currently a Teaching Professor at Montana State University.

Samuel Draznin-Nagy is a graduate of Montana State University. His research interests include reasoning, scientific thinking, and judgment and decision making.

Top Ten Pro-Science Fictional Characters

A roundup of all the best pro-science characters from your favorite books, movies, and TV shows.

BRIAN DUNNING

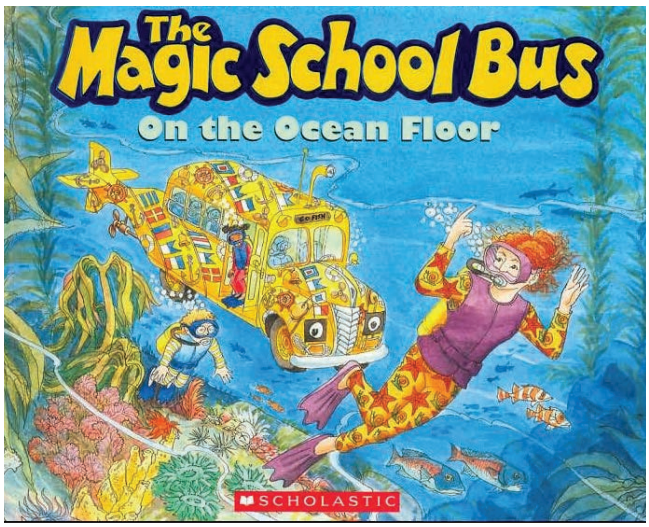
On *Skeptoid*, we've listed the best pro-science celebrities, the worst antiscience celebrities, the unsung women of science, and even the scientists who took one for the team by experimenting on themselves. Here we're going to look at a group that we haven't before: science superheroes from the realm of fiction, including TV, movies, books, and even comic books. Fiction has given us some truly enduring characters who have become household names, and fiction has given us some great scientists who made the pursuit of knowledge their core character trait. We're going to have a look at where these two groups intersect: the most famous characters who are also the best inspirations for the cause of scientific truth.

First, an explanatory note about the criteria to be included here. There are many, many characters throughout the world of entertainment who are engineers or scientists, but that rarely or never becomes a driving element of the story. We're looking instead for the characters for which that science-driven approach is fundamental to who they are and their minute-to-minute decisions. Moreover, we're looking for characters from books, movies, TV series, whatever that have become true cultural fixtures: characters who will still be household names in fifty or 100 years. These are the characters who have become our society's true influencers for the cause of science. I argue that is a high bar.

And so, I present you *Skeptoid*'s list of Top Ten Pro-Science Fictional Characters.

10. Ms. Frizzle

For more than three decades, the beloved driver of *The Magic School Bus* has transported countless millions of kids on fascinating field trips where they've learned about—well, everything. There probably isn't a single subject Ms. Frizzle hasn't taught us. She is the Mr. Rogers of science. She has an almost Zen-like way of finding a science lesson in anything. When the class gets eaten by a dinosaur, she takes it as a lesson on exploring its digestive system. Ms. Frizzle had seemingly dozens of catchphrases, usually some combination of "Get out there, explore, and get messy"—exactly the process followed by the multitudes of people who chose a career in the sciences, including the many who have cited Ms. Frizzle as their direct inspiration.



9. Dr. Gregory House

I almost didn't include the star character of *House, MD* because I'm a bit dubious that he'll rise to the level of being a true permanent fixture in fiction. But in all the conversations I had with so many in the planning of this episode, his name came up consistently. And he's a good fit. The bristly and incisive character was known for his scientific skepticism—always coming up with the correct diagnosis and treatment that the other doctors could never see. Although this ability sometimes fell into the trap of being an unrealistically prescient and inadequately founded instinct, much of the time his process was depicted as a genuine scientific investigation. House almost always followed our three C's: he would *c*hallenge the status quo; he would *c*onsider alternate explanations; and he would *c*onclude which one fit best. House was a skeptical hero.

8. Bruce Banner

This Marvel character is the Dr. Jekyll to The Hulk's Mr. Hyde—almost. Both were complex characters with inner struggles represented by their violent alter egos. But while Jekyll's internal conflict was one of good vs. evil, Banner remained ever the scientist, seeking ways to contain and control his unwanted and loathsome transformations. As one of history's best known comic book characters, Banner's multiple PhDs made it cool to be smart, and quite a few of today's scientists have named Banner as one of their early influences. Many characters are written as scientists or engineers, but it's usually just window dressing and doesn't actually drive that character's hour-to-hour decisions. Bruce Banner, on the other hand, was consumed by the scientific method, and it truly did govern his choices as a fictional character. That's the difference between a character who just has "scientist" written into his biography and one who is a true disciple of the process. Compound that with his influence as a Marvel

superhero, and you've got a true force for good in the world.

7. Ellie Arroway

The movie and novel *Contact* might not be the household name of science fiction that we're ultimately looking for, but because it was written by Carl Sagan, it gets a free pass onto this list. The protagonist, radio astronomer Dr. Eleanor Arroway, has to compete for her spot to be the sole human sent to visit an alien race—and she initially loses, because she's the one candidate unwilling to compromise her scientific and rationalist principles. Her rivals do compromise theirs and capitulate to the spiritualists, wooists, and metaphysicists and thus win the world's support. Arroway thus becomes a rare paragon of scientific integrity, an example every one of us should follow. But how many of us, given the stakes she faced, would cling so hopelessly to our moral courage when for the price of a few fibs, we could literally explore the galaxy?

6. Sherlock Holmes

While other famous literary detectives of the day relied on a certain amount of intuition, inside knowledge unknown to the reader, or even just plain *deus ex machina*, Sherlock Holmes did things the hard way, employing nothing more than grand-scale observation and reasoning. Although author Doyle always called it deductive reasoning, he did so incorrectly; Holmes actually relied much more on inductive reasoning. In a literary first, Holmes also used realistic forensic science. It was this aspect of Holmes that truly set him apart. There is even a substantial body of academic work written about Holmes's employ of forensic sciences such as ballistics and fingerprinting, comparing them to what was actually in use at the time, and it finds that his techniques were not only accurate but were often ahead of the times.

5. Victor Frankenstein

When Mary Shelley's 1818 book was published, it was the first time that a scientific experiment gained worldwide popularity in fiction, a popularity that has never diminished in the slightest. Frankenstein's experiment to reanimate a corpse with electricity was the result of years of careful study. Although it turned out badly—obviously—Frankenstein was the first superstar scientist character who was neither mad nor evil and who brought his complex human traits to bear when it became time to track down and destroy his own creation.

4. Roy Hinkley, a.k.a. "The Professor"

Setting aside all the hoary old jokes about how he could make anything out of a coconut but couldn't fix a hole in the boat, the Professor still remains so many people's favorite castaway from *Gilligan's Island*. It was a rare moment indeed that he ever broke character. Every word, every action, every choice was about finding a science-based solution to the problem at hand. Interestingly, he personified the (somewhat negative) stereotypical scientist: a middle-aged white guy who was always dry and serious and devoid of any human passions. The island's resident movie star, Ginger, even complained that the Professor was only interested in her mind. While this certainly made him more recognizable "as a scientist" to the general audience, it quite possibly made him more inspirational to the rest of us who sought a role model that would make it okay to be absorbed in one's own world, fascinated with the coils of coconut fiber that would breathe life into the makeshift conch-shell satellite telephone, free of the banal social obligations that more conventional society expected of us.

3. The Scooby Gang

If you're the right age but you say you didn't watch *Scooby-Doo* as a kid, you're a liar. You already know that the trailer park ghost is just the groundskeeper scaring people away for some insurance scam. Fred, Velma, Daphne, Shaggy, and Scooby never even paused to consider whether the ghosts were real; instead, they fearlessly charged right in to set an elaborate trap. More than anything else, the Scooby gang taught us that "Not a ghost" should be our default null hypothesis … and so far, it's never been proven wrong.

2. Dana Scully

So many shows have claimed to pair a skeptic with a believer, but almost none did so as successfully as *The X-Files* with FBI

Credit: Fox - Fox, Fair use

agents Dr. Dana Scully and UFO believer Fox Mulder. No matter what tangent Mulder flew off on, Scully was always there to bring him back down to earth and was always seeking the natural, evidence-based explanation for the countless strange phenomena they investigated. The pursuit of science was key to her character in everything that she said and did.

Fans of *The X-Files* may remember that in the later seasons, Scully and Mulder's positions essentially reversed. Scully had received so much scientifically valid confirmation of supernatural activity that the woo explanation for anything became her go-to null hypothesis; Mulder, upon learning that a government conspiracy was behind anything and everything, became the ultimate cynic and believed in nothing. But this reversal was only the case according to a superficial examination. Their underlying character motivations remained unblemished: Mulder still brushed aside the evidence in front of him and insisted upon a view that clashed with the data, and Scully—forever our skeptical hero—*changed her conclusions as newer data came in*. A scientist to the very end.

And who could ever sit at the towering apex of this lofty list? Who could possibly be the very best of this inestimable group? You already know the answer. It can only be …

1. Mr. Spock

Only in the obscurest of references in the history of fiction had any crew of any vessel included a science officer. That was until the archetypal Mr. Spock made it one of the essentials. To this day, Spock's absolute adherence to logic and rejection of emotion remain the standard by which any fictional science officer is measured.

Often, episodes of the original *Star Trek* series would end with Kirk and Bones kicking back on the bridge, having some little joke at Spock's expense. It was the perfect metaphor of playground bullies picking on the nerd. And as any *true* science nerd will agree, such ribbing is often privately relished. *Yup,* we might think, *I couldn't be happier than to have that difference exist between me and the rest of you.* Who among us was not secretly quite happy to be derided as the class brainiac?

Spock established the essentiality of the scientist in any quorum of protagonists. While Kirk provided the muscle, the passion, and the intuition, Spock made them a balanced duo with his intellect, analytics, and even a brain-based superpower or two such as the mind meld. In cases where their commendations needed to be recited on the show, Kirk's record was a veritable encyclopedia of decorations for valor and courage, while Spock's was every bit as impressive as a compendium of awards in the sciences. It was only when paired with Spock's unwavering commitment to scientific integrity that Captain Kirk succeeded so comprehensively. While others on this list made it cool to be a scientist, Mr. Spock made it an indispensable component of The Complete Human.

And so we conclude with an exhortation for all of you out there who work in the sciences or who aspire to it: Keep on top of your fiction. Keep reading, keep watching, keep playing. Keep flying the flags of fandom. We are our fictional characters, and they are us. ■

Science writer Brian Dunning is the host and producer of the popular and long-running *Skeptoid* podcast (skeptoid.com), which has had over 100 million downloads. He also is the writer and presenter of the documentary films *Here Be Dragons* and *Principles of Curiosity* and the author of seven books. He is a member of the National Association of Science Writers. Photo credit: Michael Myers.

Creationist Funhouse, Episode 7

Lynn Margulis and the Great Convergence That Didn't Happen

STANLEY RICE

When I was a sophomore at the University of California, Santa Barbara, in 1977, I was excited to attend my first real science seminar. I was on my way to hear Lynn Margulis, one of the greatest biological thinkers of modern times. First, I ran into the wrong room and sat down, only to realize that it was a psychology class, and I had to run back out. By the time I got to the lecture hall where hundreds of people had come to hear Margulis, the only place to sit was on the floor.

After one of the professors gave her an off-color introduction, Margulis proceeded to tell us all about undulipodia. Perhaps you've never heard of undulipodia. They are the cilia (motile hairs) and flagella (motile whips) of complex eukaryotic cells. (Eukaryotic cells have nuclei in which they store their DNA.) These are the hairs and whips that allow complex single cells to swim around and that allow the cells of your respiratory passages to keep themselves clean by shoving bits of goop back out so that you can cough them away. In all four of the kingdoms that have eukaryotic cells, cilia and flagella have the same structure: a ring of nine pairs of motile fibers around a central pair. This implies they had a single evolutionary origin. But what was that origin?

Margulis tried to convince all of us—professors, postdocs, graduate students, and undergrads—that undulipodia had evolved from spirochete bacteria. She had some nice photographic evidence. For example, a kind of single-celled eukaryote, *Mixotricha paradoxa,* appears to have a lot of cilia emerging from its membranes, allowing it to swim. Only they aren't cilia; they are spirochetes that have embedded themselves in the host cell membranes. If spirochetes can look and act so much like cilia, maybe cilia evolved from spirochetes. Margulis never succeeded in convincing the scientific world of this hypothesis. When I met with her in 2006, as I gathered information for my *Encyclopedia of Evolution*, she was still trying to convince everyone, including me. She died, perhaps disappointed in her quixotic quest, in 2011.

Disappointment is not what Margulis should have felt, and perhaps she didn't. This was because, quite possibly, only Charles Darwin provoked more of a shift in scientific thinking than Margulis did.

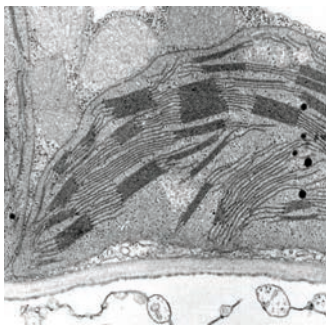
Margulis's breakthrough paper was "On the Origin of Mitosing Cells," published in 1967 in the *Journal of Theoretical Biology* after over twenty rejections from other journals. In this paper, she claimed that mitochondria (the complex cellular structures that consume sugar and produce chemical energy) and chloroplasts (the complex green structures in plant cells that make all the food in the world through photosynthesis) did *not* evolve by gradual evolution from simpler structures. She said that mitochondria and chloroplasts were both the *evolutionary descendants of bacteria:* mitochondria from respiring bacteria, and chloroplasts from photosynthetic bacteria. What this means is that the evolution of mitochondria and chloroplasts was not a gradual *increase* in complexity but instead was *sudden* and involved *simplification*.

Both mitochondria and chloroplasts are much simpler in structure than the bacteria that Margulis said they evolved from. This means that the bacteria invaded a larger, complex cell and stayed there. They then evolved into simpler—not more complex—forms. Today, mitochondria and chloroplasts

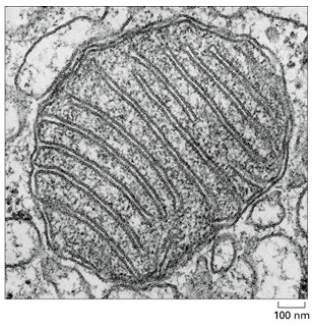
Lynn Margulis (Photo by Boston University Photography)

have degenerated so much that they cannot live outside of cells except under very careful laboratory conditions.

Here is the scenario: Bacteria moved into the host cell. At this point, three outcomes are conceivable. The host cell could have digested the bacteria, or the bacteria could have eaten the host cell from the inside. The third possibility is that the invaders and the host reached a stable balance of mutual benefit. The host cell provided sugar, and the respiring bacteria consumed it, providing cellular energy to the host. The host cell provided carbon dioxide and mineral nutrients, and the photosynthetic bacteria consumed them, providing sugar in return. They formed stable, mutualistic partnerships. From that point, the bacteria and cyanobacteria lived in a simple environment inside the host cells and had all their needs taken care of. They lost the complexity that they needed to survive by themselves in the outside world. This is the *endosymbiotic* theory: *endo* for "inside" and *symbiotic* for "life together," or mutual cooperation between species. *Symbiogenesis* means the origin (genesis) of new life forms through symbiotic merger.



Transmission electron micrograph of a chloroplast



Transmission electron micrograph of a mitochondrion

Today's eukaryotic cells are therefore the products of two of the most successful mergers in the history of the planet. You can think of it this way: The main function of a leaf is to keep its chloroplasts safe and happy so that they can make food through photosynthesis. Chloroplasts need to be kept wet and cool, something that would be impossible for them on dry land. The main function of the stems and roots is to provide water and minerals to the leaves, to feed the chloroplasts and to keep them cool. Viewed in this way, a whole tree exists just to keep the chloroplasts happy. The fact that most of the land surface of the earth is green is evidence of the striking success of this symbiotic partnership. Earth, seen from outer space, is a green planet because of symbiogenesis. Photosynthesis also produces almost all the oxygen in the air. Take a deep breath and thank a plant that you are alive—and thank the process of symbiogenesis.

Before Margulis, almost every scientist, except a few obscure researchers in Russia and the United States, believed a naive version of evolution: that everything started simple and evolved, a bit at a time, into greater complexity. This was undoubtedly one of the reasons there was so much initial resistance to Margulis's endosymbiotic theory. There was also a little bit, or perhaps more than a little bit, of sexist resistance. There were and are many women in science, but at the time women played more of a supporting role while men were the thinkers and leaders, the movers and shakers. Think of Watson and Crick getting almost deified for their discovery of the structure of DNA in 1953, while Rosalind Franklin died in relative obscurity soon thereafter. As often happens in science, there was a quick transition straight from "This is crazy" to "Everybody has always known this" regarding Margulis's theory.

Margulis explained the origin of eukaryotic cells in terms of the serial endosymbiotic theory. First, the eukaryotic cell nucleus evolved as a result of a merger between two microbes. Some kind of small microbe—maybe an archaean, maybe a mimivirus, nobody knows—moved into a larger microbe and became the nucleus. Second came the undulipodia. Third, the mitochondria. These things happened in the ancestors of all eukaryotic cells and organisms. Fourth and finally, in the ancestors of some of the eukaryotic cells and organisms, photosynthetic bacteria moved in and became chloroplasts of modern plant cells. And there it is: life on earth in all its dizzying and astonishing complexity.

Margulis saw this story as being typical of the way life works. Instead of "survival of the fittest," with organisms striving against one another for the greatest fitness, organisms often (perhaps usually) cooperate with one another, and in the process the two cooperators both achieve greater success than either would alone. She thought that many scientists, even though they grudgingly admitted she was right about mitochondria and chloroplasts, believed her story was the exception rather than the rule. But she looked around and saw symbiogenesis everywhere. She was especially enthusiastic about James Lovelock's Gaia hypothesis, in which the earth as a whole kept itself in balance rather than being the arena in which all of its species fight one another.

Many of us have caught Margulis's spirit of excitement about this view of life. The earth is alive, not just the third rock from the Sun that happens to have life. There is nothing mystical involved here—Margulis made sure I understood that Gaia was not a goddess. Even though many mystics have embraced the Gaia view, the spiritual form of the Gaia hypothesis has been rightly skewered in the pages of books and magazines such as this one. I wrote more about this in my book *Life of Earth: Portrait of a Beautiful, Middle-Aged, Stressed-Out World*, a book that Margulis particularly liked. Life *of* earth, not life *on* earth.

The interconnections of life, the basis of Gaia theory, might be the reason that conditions on earth are relatively stable. For example, the billions of tons of leaves remove carbon dioxide from the air, preventing (at least until recently) a massive greenhouse effect. Back during the Precambrian time, before the earth was covered with plants, it lurched back and forth between extreme heat and extreme cold. But ever since plants started covering the land about 400 million years ago, photosynthesis partially stabilized the climate. The symbiogenetic origin of chloroplasts allowed plants to evolve and

eventually cover the land and stabilize the earth.

But here is the point: Creationists don't believe that this symbiotic convergence ever happened. They believe that God made the eukaryotic cells and organisms all at once about 6,000 years ago, the same time he made bacteria. As a result, creationists miss the whole point of what makes this view exciting: the symbiogenetic view reveals an earth in which cooperation between species leads to continual evolutionary renewal.

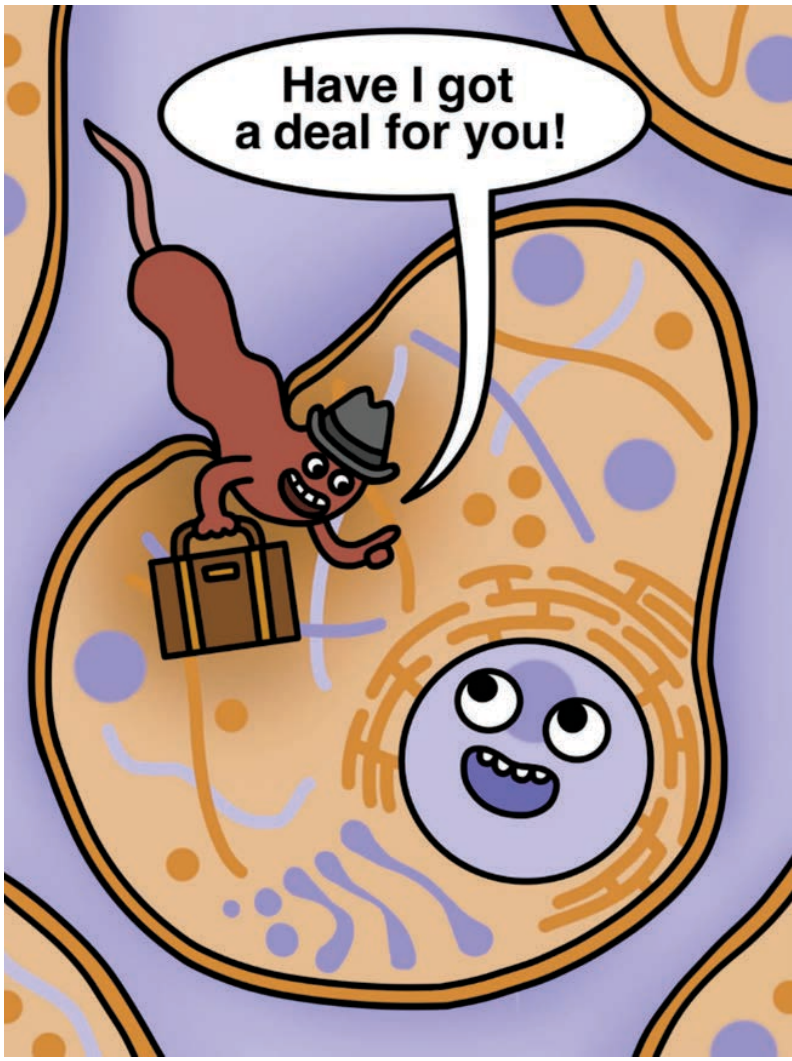
Not only that, but creationists believe that God planted many deceptive pieces of evidence that falsely suggest that symbiogenesis occurred. Mitochondria and chloroplasts *have their own DNA* and even their own machinery for using it. These are relics of their bacterial ancestry. Their DNA resembles circular bacterial DNA, not the linear DNA of eukaryotic chromosomes. Did God make mitochondria and chloroplasts look like *they used to be bacteria* even though they did not?

Perhaps most intriguingly, some eukaryotic cells have very complex chloroplasts. In most cells, chloroplasts are the evolutionary descendants of photosynthetic bacteria; they are cells inside of cells. But some green and red algae have chloroplasts that evolved not from bacteria but *from other algae*. That is, they are cells inside of cells inside of cells. They have extra membranes not found in ordinary chloroplasts. Some of them even have little degenerate nuclei. Did God make these algae look like they were the products of *two* symbiogenetic mergers, when in fact not even one had occurred?

Symbiogenetic mergers might be happening all around us, and we just don't see them. One scientist, Kwang Jeon at the University of Tennessee, studied amoebas and was set to finish his obscure career as an amoeba expert. Then one day a bacterial disease broke out in his cultures. *There goes my career*, he might have thought. But he found that some of the amoebas survived—with bacteria living inside of them. These bacteria-filled amoebas died if they were treated with an antibiotic that killed the bacteria. It appeared that, right in his lab, a symbiogenetic merger had happened in which the amoebas and bacteria had reached a balance and required one another for their very survival. A couple decades later, one kind of eukaryotic single-celled algae was observed moving into another, and it stayed there. Scientist Noriko Okamoto caught it on film.

Symbiogenesis might make you never view a forest the same way again. When you look at a forest, you see trees. The trees each appear to be individuals all struggling against one another for light, water, and minerals. But biologists have discovered that many of the tree roots are connected; in particular, the symbiotic fungi within the tree roots connect one tree with another. This may even allow the trees to communicate and coordinate with one another, according to botanist Peter Wohlleben and fungus expert Paul Stamets. I've closely observed trees all my life, but I now have a whole new view of forests.

This exciting view of evolution is one that creationists cannot allow themselves to believe. It is one for which they cannot praise God. They believe that the world is running down and has no hope unless God rescues it—which he won't—which means that God planted fake evidence of symbiogenesis in all species. It sounds like they want us, despite all the evidence, to see the natural world as damned and fallen.



Cartoon by Loraine Thompson

The symbiogenetic view is one that would eventually have been discovered anyway, just as Wallace would have revealed natural selection even if Darwin were never born. But we owe a lot to the brilliance and perseverance of Lynn Margulis. One of her early supervisors described her as being the only staff member at Boston University who was paid half time and worked time and a half. She never gave up. ■

Stanley Rice is professor of biological science at Southeastern Oklahoma State University and the author of five popular science books, most recently *Scientifically Thinking: How to Liberate Your Mind, Solve the World's Problems, and Embrace the Beauty of Science*. He has been dealing constructively with creationism as a college science educator for three decades.

Teens These Days: Sex, Drugs, and Malarkey

Adults often assume that teens exhibit worse behavior than they really do, especially involving sex and drugs—and many prevention programs developed to address the exaggerated behavior among teens are ineffective. Two are infant simulator dolls and the D.A.R.E. program.

STEPHEN HUPP

When many adults talk about adolescence, they often invoke depictions of "teens these days" whose lives are sex-crazed and drug-filled. Ironically, these same adults often support prevention programs that are ineffective. In this article, I present two of the prevention myths that are adapted from the book *Great Myths of Adolescence* (Jewell et al. 2019) and a CSICon presentation (Hupp 2018).

Sex Prevention Pseudoscience: Infant Simulator Dolls

About 38 percent of high school students in the United States anonymously acknowledge that they have had sexual intercourse (Center for Disease Control and Prevention 2019). Although high, this percentage has actually been on the decline and is not nearly as high as many alarmists would have us believe (see Best and Bogle 2014 for a discussion of the hype). That said, it's no surprise that schools have become interested in trying to prevent teen pregnancies. "When we started the Baby Think It Over Program three years ago, we were averaging three pregnancies per year," expressed a junior high school teacher, adding, "This past school year no pregnancies were reported" (Realityworks 2004). The Baby Think It Over program mentioned in the testimonial has been more recently branded as the RealCare Baby program, and it's similar to another competing product called the Ready-Or-Not Tot. More generically, these products are referred to as infant simulator dolls.

These products look like any other baby doll, but they come with enhanced technology. For example, when a doll cries, the computer inside keeps track of the students' attempts to feed the doll or change its diaper. The dolls are also able to monitor if they're being handled too roughly (e.g., shaken) or exposed to unsafe environments (e.g., cold temperatures). Teachers are also able to set the level of difficulty provided by the doll's temperament. Students typically take care of the doll for several days and nights in a row, and teachers can access the data kept by the dolls to give the student feedback and perhaps a grade. These dolls are usually embedded within programs that include lessons (e.g., information about infant care) and exercises (e.g., finding out how much diapers cost).

Infant simulator dolls have been prominently and positively featured on television shows such as *Saved by the Bell* and *Hannah Montana*, and they are viewed favorably by the public. In our research, 50–53 percent of college students believed that "Taking care of an infant simulator doll increases abstinence" (Jewell and Hupp, manuscript in preparation). In a study of parent perceptions of a program using the dolls, 90 percent of the participants indicated that they would recommend that a friend use an infant simulator doll with their teen (Price et al. 1999). In another sign of public support for infant simulator dolls, according to the company, the RealCare Baby program is currently being used by two-thirds of school districts in the United States (Realityworks 2016). Is this wide use of this preventative approach warranted?

In our research, 50–53 percent of college students believed that "Taking care of an infant simulator doll increases abstinence."

There have been several studies of infant simulator dolls, and one of the studies with the best research design is by Sally A. Brinkman et al. (2016). Researchers in Australia randomized fifty-six high schools such that half of the schools served as the prevention group with their students completing the Virtual Infant Program (VIP), centered on infant simulator dolls, and the other half of the schools served as the comparison group with their students receiving their standard health education curriculum. Both groups had over 1,000 female participants (ages thirteen to fifteen) who were contacted again years later at age twenty. During this later time period, 8 percent of the group that received the VIP program had given birth, and this was compared to 4 percent of the comparison group that had given birth. The VIP group also had more abortions (9 percent) than the control group (6 percent). Taken together, the students who were in the program using infant simulator dolls were significantly *more* likely to get pregnant. Other studies fail to show that infant simulator dolls change behavior in teens (e.g., Out and

Lafreniere 2001).

In fact, no studies show an actual change in sexual behavior or pregnancy outcome in a direction favorable to infant simulator dolls. Moreover, in addition to the Australian study showing that adolescent girls were more likely to get pregnant if they cared for the doll, other research has demonstrated a potentially harmful effect of the dolls. For example, in one study 12 percent of students reported wanting to be teen parents *before* caring for an infant simulator doll, and this increased to 15 percent of the teens wanting to be teen parents *after* caring for the doll. Thus, it is possible that infant simulator dolls are actually harmful rather than helpful. In addition to the potential harm possibly experienced by some teens, the dolls also cost the school a lot of money that could be used for more effective programming.

Drug Prevention Pseudoscience: The D.A.R.E. Program

Drug Abuse Resistance Education (D.A.R.E.) is a *universal* prevention program, which means that it's offered to all the children in a particular school grade; it is not a *selected* or *indicated* prevention program that would be just for students who are at greater risk or show early signs of substance use. Police officers visit schools to implement D.A.R.E. lessons to children in fifth or sixth grade once a week for about seventeen weeks. In addition to covering topics such as changing beliefs about drugs, the program has lessons dedicated to teaching assertiveness and healthy ways to manage stress. D.A.R.E. has also sought to decrease violence and prevent youth from joining gangs, typically ending with a graduation ceremony and certificate.

The program began in 1983 in Los Angeles, and since then it has really taken off. D.A.R.E. can currently be found in about 75 percent of American school districts across all fifty states, and it's taught in over fifty additional countries (D.A.R.E. America 2014). In short, millions of children receive D.A.R.E. each year, and a lot of people believe it works. In our own research, 40–44 percent of students agreed with the statement that "D.A.R.E. prevents teen drug use" (Jewell and Hupp, manuscript in preparation).

From the beginning, the developers of D.A.R.E. did little to investigate its effectiveness, but when researchers began investigating the program's effects it did not fare very well. In one of the best studies of D.A.R.E., researchers randomly assigned elementary schools to an experimental group who received D.A.R.E. from a police officer or to a comparison group receiving a curriculum of "whatever the health teachers decided to cover concerning drug education in their classes" (Lynam et al. 1999, 591). Ten years later, the researchers paid participants to report about their drug use on a questionnaire. Results demonstrated that there were no differences between the D.A.R.E. group and the comparison group on drug use for alcohol, cigarettes, marijuana, or illicit drugs. Moreover, peer pressure resistance was no better for the D.A.R.E. group, and self-esteem was significantly *lower* for students who had been in D.A.R.E., a finding that the investigators attributed to chance.

Quite a few other studies have demonstrated similar results regarding D.A.R.E.'s effectiveness. One meta-analysis combined the data from eleven studies on D.A.R.E. (including the ten-year follow-up discussed above) that were published between 1991 and 2002 (West and O'Neal 2004). The results of this meta-analysis again confirmed that D.A.R.E. was ineffective at preventing drug use.

Recognizing that D.A.R.E. was ineffective, the organization attempted to develop a new curriculum called Take Charge of Your Life for students in seventh grade, with a booster in ninth grade. Shockingly, however, research showed that students in the treatment schools actually ended up being *more* likely to use alcohol and cigarettes than students in the comparison group during the follow-up (Sloboda et al. 2009). This version of the program was quickly abandoned after it continued to show weak results (Singh et al. 2011).

Rather than giving up on D.A.R.E. or trying to develop another new curriculum, the organization began searching for a program that was already effective. They found a program called Keepin' It REAL (Refuse, Explain, Avoid, & Leave), comprising ten lessons delivered by teachers of students in seventh grade (Hecht et al. 2003). Largely designed for Latino students, most of the studies demonstrated mixed results of Keepin' It REAL with the Latino samples (Hecht et

al. 2006; Marsiglia et al. 2005; Warren et al. 2006). However, these early studies of Keepin' It REAL included some limitations. For example, they were all based on self-report and did not include follow-up measurements after the immediate post-intervention measurement. However, there were enough initial positive results to prompt D.A.R.E. to officially adopt the Keepin' It REAL program in 2009. It is important to note that the original Keepin' It REAL curriculum is not the same curriculum that is used by D.A.R.E. Developers combined aspects of the program with the original D.A.R.E. curriculum, and they also created another version for elementary school that captured the same market as the original D.A.R.E. program (Caputi 2015).

The adoption of Keepin' It REAL, which had mixed research support, gave D.A.R.E. program administrators some confidence, and an article in *Scientific American* was even titled "The New D.A.R.E. Program—This One Works" (Nordrum 2014). However, it is a bit of a stretch to assert that this "new D.A.R.E." works because the new D.A.R.E. version of Keepin' It REAL has not been investigated. One big difference between the original version of Keepin' It REAL and the D.A.R.E. version is that the latter uses police officers instead of school teachers. In *addition*, Keepin' It REAL has little evidence of effectiveness beyond the Latino samples in its research. Moreover, when the developers of Keepin' It REAL previously attempted to adapt their program for fifth grade, it fared no better than a comparison group (Hecht et al. 2008).

Conclusion

Many of the popular ways that we attempt to promote healthy choices in adolescents do not work. Fortunately, we have some other good options. For example, research supports the use of comprehensive sex education (Bennett and Assefi 2005). In addition, prevention programs, such as Life Skills Training, have shown promise in preventing adolescent drug use (Botvin and Griffin 2004). In other good news, adolescent sexual activity and most types of drug use have been declining over the past few decades (Arnett 2018). Thus, good progress is being made, but as always there is more to be done—ideally with methods shown to be effective. ■

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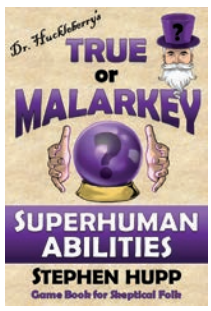


Stephen Hupp, PhD, is a psychology professor at Southern Illinois University Edwardsville. His books include *Dr. Huckleberry's True or Malarkey? Superhuman Abilities*, *Great Myths of Child Development*, *Great Myths of Adolescence*, and *Pseudoscience in Child and Adolescent Psychotherapy*.
Twitter: @StephenHupp.

A Christian Geologist Explains Why the Earth Cannot Be 6,000 Years Old

A new book gives evidence of how creationists promote pseudoscience. It agrees with the views of scientists and skeptics who insist on truth and integrity in science.

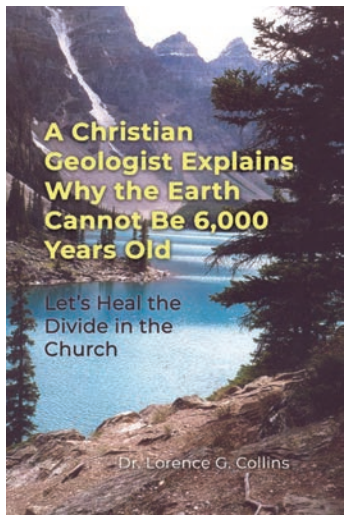
LORENCE G. COLLINS

I am hoping my book *A Christian Geologist Explains Why the Earth Cannot Be 6,000 Years Old* (published by Dorrance Publishing) will be of interest to skeptics and atheist readers of this magazine. This book is not only for Christians but also for those seeking the truth and who object to fake science. It gives evidence that Earth and the universe cannot be 6,000 years old and that a worldwide flood never happened—the viewpoint of flood geologists. It admits that atheists have good reasons to reject the wild speculations that some fundamentalist Christians (young-earth creationists) have required for being good Christians. In my knowledge as a Christian of how Jesus lived, he would accept atheists and skeptics with open arms because—like atheists and skeptics—he was extremely critical of hypocrites (Matthew 23:13). Moreover, one of his disciples was even a skeptic (Thomas the doubter). At any rate, I have found atheists not to be hypocrites but good moral people and to have many words of wisdom, speaking the truth. A couple of atheists have given me great help when I have sought their advice.

In support of my objections to the pseudoscience promoted by young-earth creationists, Skeptical Inquirer earlier published three of my articles exposing such pseudoscience as espoused by the creationist organization Answers in Genesis: "Twenty-One Reasons Noah's Worldwide Flood Never Happened" (March/April 2018); "Response to Ken Ham and YouTube Comments by Andrew Snelling" (July/August 2018); and "Biological Reasons Young-Earth Creationists' Worldwide Flood Never Happened" (September/October 2018).

The discussion of topics in these three articles has been further expanded in this new book to include the following eleven other topics.

1. The evolutionary history and origin of the Hawaiian Islands shows that the coral growth in the Kure atoll at the bend where the Emperor Seamount Chain extends north of the Hawaiian Ridge required at least 35 million years to form. The more than 30,000 feet of lava flows that extend from the ocean floor to the top of the volcano Mauna Kea in the main island of Hawaii could not have been erupted and deposited in 4,500 years.[1]


A Christian Geologist Explains Why the Earth Cannot Be 6,000 Years Old
Let's Heal the Divide in the Church
Dr. Lorence G. Collins

2. There is evidence that radiocarbon dating can be applied to carbon-bearing samples from the biosphere with ages up to 30,000 years and to samples up to at least 50,000 years with increasing error bars.[2]

3. Polonium halos in biotite mica requires millions of years to form. The granitic igneous rocks in which they are found must first be injected into the earth's crust as magma and then cooled and crystallized as solid rocks. This must have taken place over millions of years before these rocks could be deformed to allow polonium halos to form by diffusion of radioactive polonium and radon atoms into biotite where the halos are found.[3]

4. The evolution of apes and humans, plants (tree ferns, lycopods, cycads, *Lepidodendron*, and horsetails), and animals (cats, birds, and elephants) could not possibly have taken place in a scant 6,000 years.

5. The origin of oxygen in the earth's atmosphere prior to the time in which multicellular life could form is not mentioned in Genesis in the Bible.[4]

6. Evidence shows that a single glacial ice age, lasting less than 700 years, did not occur after Noah's flood 4,500 years ago as claimed by fundamentalists. The present ice occurred during the Pleistocene, with four glacial periods over the past 400,000 years.[5]

7. The chlorine ion in the world's oceans is a component of salt deposits (sodium chloride, NaCl). These deposits occur on four out of the five world continents and in many different geologic periods. The Bible indicates only *one* period of drying and evaporation at the end of the flood that would produce salt deposits. The accumulation of chlorine ions in the world's oceans results from a residence time of at least

100 million years.[6]

8. The formation of myrmekite (the vermicular intergrowth of quartz in plagioclase feldspar) in deformed plutonic igneous rocks require millions of years for emplacement, cooling, and crystallization in the earth's crust before deformation of the solid rocks can occur. This allows chemical replacement processes that produce the myrmekite in recrystallized rocks of different mineral and chemical compositions.[7]

9. The supposed intelligent design of life in 6,000 years instead of during evolutionary processes over billions of years. Intelligent design (ID) is a model suggested by young-earth creationists of how each species of life is created by a supernatural being.

10. The Precambrian history of the earth includes almost 90 percent of its history, but according to young-earth creationists, all this history occurs on day three of the Genesis week.[8]

11. A local large flood possibly occurred in Mesopotamia in biblical times.[9]

A Christian Geologist Explains Why the Earth Cannot Be 6,000 Years Old contains many color images of geologic features that cannot have been produced during a year-long flood. They include the following eight items:

1. Glacial grooves and striations on sandstones in the Sahara Desert must have formed by erosion of continental ice many thousand feet thick flowing from the South Pole. In the flood geology model, this would have to have happened during Ordovician time in less than a month during the early part of Noah's flood. It would then have had to melt away before overlying younger Silurian sedimentary rocks were deposited.

2. Raindrop prints on sand or mud (shale) of Cambrian, Silurian, Devonian, Mississippian, Permian, and Triassic ages could not have occurred if all sedimentary rocks were deposited under water during Noah's flood.

3. Quartz geodes (composed of silica as crystals lining cavities in limestone) could not have formed simultaneously out of Noah's flood waters. Calcium and carbonate ions form calcite crystals in the limestone but could not have simultaneously dissolved large holes in the limestone in which the quartz crystals could grow and line the hole.

4. Coccoliths (algal fossils containing calcium carbonate support structures) exist in Cretaceous chalk beds more than 350 feet thick in the White Cliffs of Dover. These chalk deposits would have required more than the year of Noah's flood to form because (a) these plants require sunlight, (b) such a thick layer of plants floating in Noah's flood waters would prevent the coccoliths a few feet below the ocean surface from receiving any sunlight, and (c) it would be impossible to have enough calcium dissolved in Noah's flood waters to make so many (trillions and trillions) of these coccoliths in the one year of Noah's flood.[10]

5. Radiolarian fossils consist of silica skeletons and occur in a 14,000-foot-thick layer on the Pacific Ocean floor. These creatures require sunlight to exist, and there could not have been sufficient silica dissolved in the ocean waters to make such a thick layer in the less than 4,500 years since Noah's flood.[11]

6. Cross-bedding in sandstones with angles of dip greater than thirty degrees are found in the Navajo and Coconino Sandstones but only in desert dunes. Desert dunes could not have formed during Noah's flood.[12]

7. Clay layers in shale deposits interlayered with volcanic ash layers cannot have been deposited by flood waters moving at hurricane or tsunami speeds without mixing the settling clay and ash particles. Neither could more than 3,000 feet of clay particles in the Cretaceous Mancos Shale be deposited and capped by a thick sandstone layer that has river channels that cut down into the shale and contain fossil tree trunks. Noah's rushing flood waters would have scattered these tree trunks instead of depositing them in narrow channels.

8. Cetaceans (including whales, dolphins, and porpoises) and sea reptiles have similar body shapes and ecological marine habitats. Their fossil remains could not have been separated from each other by Noah's flood waters if both animal types were living at the same time during the year of the flood.

In addition, I have forty-nine articles on my website Articles in Opposition to Creationism[13] that might be of interest to skeptics and atheists; the following four articles should be of particular interest: "New Discoveries about Stonehenge vs. Flood Geology,"[14] "Fountains of the Great Deep and Noah's Flood,"[15] "Navajo Sandstone in Zion National Park and the Formation of Moqui Balls—Failure of the Young-Earth Creationists' Flood Geology Model,"[16] and "Radiohalos—Solving the Mystery of the Missing Bullets—Origin of Po halos Revisited."[17] ■

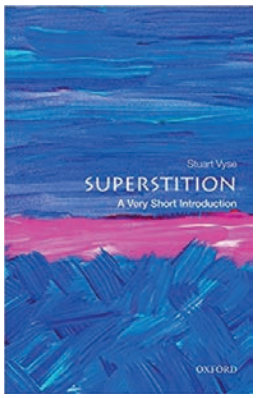
Notes

1. http://www.csun.edu/~vcgeo005/Nr61Hawaii.pdf
2. http://www.csun.edu/~vcgeo005/Nr53Carbon.pdf
3. http://www.csun.edu/~vcgeo005/Collins&Collins.pdf
4. http://www.csun.edu/~vcgeo005/Nr40tillites.pdf
5. http://www.csun.edu/~vcgeo005/Pleistocene%20glaciers.pdf
6. http://www.csun.edu/~vcgeo005/collins.pdf
7. http://www.csun.edu/~vcgeo005/Nr56Metaso.pdf
8. http://www.csun.edu/~vcgeo005/Nr55Credible.pdf
9. http://www.csun.edu/~vcgeo005/Collins2.pdf
10. http://www.csun.edu/~vcgeo005/Nr55Credible.pdf
11. http://www.csun.edu/~vcgeo005/Nr55Credible.pdf
12. http://www.csun.edu/~vcgeo005/Nr62Horseshoe.pdf
13. http://www.csun.edu/~vcgeo005/creation.html
14. http://www.csun.edu/~vcgeo005/Nr65Stonehenge.pdf
15. http://www.csun.edu/~vcgeo005/Nr64Fountains.pdf
16. http://www.csun.edu/~vcgeo005/Nr67Moqui.pdf
17. http://www.csun.edu/~vcgeo005/Nr69Radiohalos.pdf

Lorence G. Collins is a retired professor of geology from California State University Northridge, who taught mineralogy, petrology, and photogeology interpretation for thirty-three years.

Superstitionology for People in a Hurry

William M. London



Superstition: A Very Short Introduction. By Stuart Vyse. Oxford, United Kingdom: Oxford University Press, 2020. ISBN 9780198819257. 168 pp. Softcover, $11.95.

Readers of Stuart Vyse's engaging, enlightening, and fair-minded Behavior & Belief columns in Skeptical Inquirer magazine and at Skeptical Inquirer Online won't be surprised that his *Superstition: A Very Short Introduction* makes another significant contribution to promoting skeptical inquiry.

The book is part of Oxford University Press's Very Short Introductions series of more than 600 books, each intended to be both a stimulating, accessible starting point for readers to approach a new subject and a gateway toward more in-depth study. This book succeeds in furthering the Very Short Introductions mission. I especially liked Vyse's chapter on the psychology of superstition, but he also provides a scholarly overview of the history and ongoing societal impact of superstition.

I recommend that instructors of critical thinking courses consider Vyse's book for assigned reading, especially because Very Short Introductions are available online through many university libraries. I also recommend it for independent learners interested in pursuing serious study related to skeptical inquiry. The book ends with recommendations for further reading related to each of its six chapters plus a list of dictionaries and encyclopedias of superstitions.

Although the book is clear, insightful, and illuminating, I was disappointed that it doesn't begin by defining its subject and doesn't ever provide an adequate definition to enable readers to reliably distinguish superstition from non-superstition. Other books about superstition also have this shortcoming. Only one of the six other books about superstition in my home library defines the term, but its definition is nebulous.

I recommend that instructors of critical thinking courses consider Vyse's book for assigned reading.

An unambiguous, useful definition is provided in *How to Think about Weird Things: Critical Thinking for a New Age, Fourth Edition* by Theodore Schick Jr. and Lewis Vaughn: "A superstition is a belief that an action or situation can have an effect on something even though there is no logical relation between the two." Almost all examples of superstition in Vyse's book (including curses, bloodletting, lucky/unlucky numbers, black cats, walking under ladders, breaking a mirror, spilling salt, four-leaf clovers, crossing fingers, knocking on wood, horseshoes, evil eye, astrology, tarot card reading, homeopathy, and feng shui) fit this definition. Nevertheless, he writes on page 1: "The concept of superstition has been with us for millennia and yet today it has no agreed upon meaning."

Without a useful definition to delimit the book's content, Vyse includes in his final chapter, "The Future of Superstition," a paragraph about people who don't endorse the scientific consensus that global warming is caused by human activities. While I'm convinced that those people are wrong, I think their belief is out of place in his book. Denialism is not the same as superstition.

Vyse's first chapter addresses the origins of superstition with an exploration of the activities of shamans, magi, sorcerers, and prophets in ancient civilizations. Vyse then tells the fascinating story of how superstition came to mean bad religion. The Greek word *deisidaimonia* had the positive meaning in the fourth century BCE of being "scrupulous in religious" matters, but a century later, it came to mean being excessive and reflecting misplaced fear of the gods. It was translated into Latin as *superstitio*, meaning excessive awe and fear of the gods. Vyse explains that while belief in the reality and pervasive influence of gods was the establishment belief in the time of Plutarch, *superstitio* was regarded as even worse than atheism. *Superstitio* took on the meaning of being anti-Roman and was applicable to the religious beliefs of people the Ro-

mans conquered. Its meaning evolved to "bad religion."

As Christianity gained popularity, *superstition* came to be applied by Christians to pagan belief, common luck-enhancing practices that remain common today, incantations, prohibited types of sacrifices, prohibited forms of worship, weather magic, demonic magic, love spells, sorcery, astrology, witchcraft, and other practices deemed heretical. Vyse provides an interesting narrative of European history up through the Middle Ages and Renaissance describing evolving views within Christianity toward superstitions and Christianity's often brutal, superstition-driven responses toward heresies. He notes that Catholicism developed its own superstitious rituals, some of which were adopted by Protestants. He also discusses what are sometimes called Wars of Reformation and Counter-Reformation between Catholics and Protestants in Europe.

Vyse provides an interesting narrative of European history up through the Middle Ages and Renaissance describing evolving views within Christianity toward superstitions.

Vyse refers to the Enlightenment as a time of secularization of superstition and transformation of superstition's meaning to "bad science": unscientific beliefs that defied reason. He describes nineteenth-century superstitious spiritualism practices that thrived despite the growing dominance of scientific thinking. They included the Fox sisters supposedly communicating with the dead, Ouija board use, seances, Swedenborgian spiritualism, mesmerism, and Shakerism. He notes how spiritualism continued to be popular into the 1920s, and remnants of it re-emerged in the 1970s as the New Age movement. Skeptical Inquirer readers are familiar with its contemporary manifestations.

Vyse attempts to clarify his "bad science" standard by describing what superstition is not. He gives the example of the 1994 book *Higher Superstition: The Academic Left and Its Quarrels with Science* by Paul R. Gross and Norman Levitt as an example of "not using superstition in a way that is useful to us" and objects to using "the word as a brickbat at any unsupported idea." It seems to me that Gross and Levitt's use of superstition fits Vyse's definition, and Vyse is making an unnecessary *post hoc* exception. I also disagree with his point that it's unfair to consider the beliefs of a pre-scientific culture superstitious.

I disagree with Vyse's point that it's unfair to consider the beliefs of a pre-scientific culture superstitious.

Nevertheless, I agree with him that religion and paranormal beliefs in general should not be considered superstitions even though some individual activities in religion or related to paranormal beliefs are superstitious. And I also agree with him that superstitions will always be with us. ■

William M. London is a professor of public health at Cal State Los Angeles, the editor of the *Consumer Health Digest* e-newsletter at Quackwatch, and a columnist for Skeptical Inquirer Online.

Alleged Mysteries Revisited

Manfred Cuntz

Big—If True: Adventures in Oddity. By Benjamin Radford. Corrales, New Mexico: Rhombus Publishing. 2020. ISBN 978-0-9364-5517-4 (paper), 978-0-9364-5518-1 (ebook). 268 pp. Softcover, $27.50.

Broadly speaking, there are three categories of the unknown: stuff we don't know but should, stuff we don't know but may know eventually, and stuff we will (almost certainly) never know. Topics examined in *Big—If True: Adventures in Oddity* by Benjamin Radford somehow fall within those three categories—even though most of them could safely be placed into category one. Casting serious doubts about established facts almost always stems from ignorance and denial.

Based on his popular "Skeptical Inquiree" columns in this magazine, *Big—If True* deals with a broad assortment of mysteries—at least as they are viewed by notable segments of the general public. They include Bigfoot (of course!), UFOs (of course!), mummies, ghosts, mystical lights, Icelandic elves, issues associated with homeopathy, and claims about the mysterious departure of Elvis Presley (or is he still around?). Furthermore, Radford also considers lesser-known mysteries such as the Texas Goat-Man and the Chupacabra.

Radford is an investigator, award-winning author, and research fellow of the Committee for Skeptical Inquiry. Previously, he has authored, coauthored, or contributed to over twenty books and written many articles on a wide range of topics, including urban legends, unexplained mysteries, and media literacy. He also presents his work at universities and conferences on a regular basis and has appeared on many news outlets such as *Good Morning America*, CNN, The History Channel, BBC, ABC News, and the *New York Times*. Thus, Radford is a very active member of the skeptical movement and strongly committed to deciphering pseudoscience.

Two topics caught my attention: Radford's discussion of crop circles and his piece about the dating service eHarmony.

Big—If True is well written. It is organized into eight chapters, each devoted to a distinct topic: Legends, Monsters, Ghosts, Mysterious Powers and Places, UFOs, Health and Medicine, Conspiracies, and Skepticism. The text is enriched by many pictures and quotes, typically by those who have either added to the strange claims or were able to provide additional information or rumors. Based on my impression, each entry has been carefully researched and is backed up with detailed information that can be independently verified. A valuable feature of this book is that each chapter concludes with a list of references of considerable length; it adopts the same rigor as scientific research papers published in professional journals.

Big—If True features many examples of debunking pseudoscience. Two examples in particular caught my attention: Radford's discussion of crop circles and his piece about the dating service eHarmony. In modern times, crop circles were first found in Southern England and have attracted the attention of the general public, scientists, and fringe researchers alike ever since. Radford offers a detailed account of his work as a researcher and communicator. Today, there is overwhelming evidence that crop circles are attributable to humans—perhaps in rare cases assisted by wind and weather—and almost certainly not visiting aliens. The discussion about crop circles is especially timely considering the ongoing controversy about the nature of 'Oumuamua, arguably the first known interstellar object detected passing through our solar system. It is noteworthy that at least one astronomer has argued that this object represents an example of alien space technology—however, additional studies did not substantiate this hypothesis. On the other hand, the debate on the realism of UFOs has recently been revitalized by the U.S. military in the view of various unexplained sightings. But in the absence of additional data, any kind of non-natural interpretation remains highly speculative.

The second example is Radford's

Each entry has been carefully researched and is backed up with detailed information that can be independently verified.

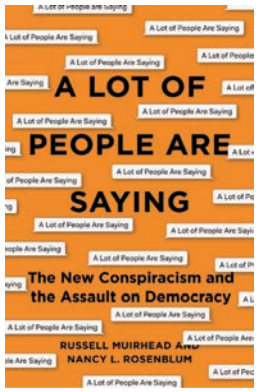
investigation into eHarmony, an online dating website launched in 2000 based in Los Angeles. Owned by a German media company, eHarmony argues that it uses scientific methods, including the concept of 29 Dimensions (a registered trademark by eHarmony), to predict great relationships and marriage success. This claim—if true—would give the company an edge over competitors in the online dating industry. Radford describes the many flaws in eHarmony's advertised claims, including the relatively small number of eHarmony couples who have married (based on information provided by S. Carter, director of research at eHarmony) compared to the total number of eHarmony clients. Additionally, Radford carefully elaborates that the two professional research studies provided by eHarmony in support of their claims turned out to be not meaningful.

Finally, I wish to point out that *Big—If True* is very timely and appropriate. Unfortunately, there is a steadily increasing body of "fake news" in the public domain, heavily fostered by the wide-ranging capacity of the internet (and sometimes also assisted by image manipulation tools such as Photoshop). The approach and professionalism adopted in *Big—If True* would thus be highly useful in other contexts as well, including targeting hot-button issues encountered in the political arena. ■

Manfred Cuntz is a professor of physics at the University of Texas at Arlington (UTA), with a focus on astrophysics and astrobiology.

Government without Facts

PETER HUSTON



A Lot of People Are Saying: The New Conspiracism and the Assault on Democracy. By Russell Muirhead and Nancy L. Rosenblum. Princeton, NJ: Princeton University Press, 2019. ISBN 9780691188836. 211 pp. Hardcover, $14.95.

Has the world seemed a bit extra irrational, a bit extra crazy, the past few years? If you feel that way, you are not alone. Russell Muirhead, a professor of politics and democracy at Dartmouth, and Nancy L. Rosenblum, a professor of ethics in politics and government at Harvard, clearly have also felt this way. *A Lot of People Are Saying* was written when Donald Trump was still president, but its warnings and lessons remain valid today. The authors clearly see the now former president as a major problem, detailing the way he manipulates people by distorting issues and knowingly spreading misinformation. They see this as a major problem that undermines the American democratic system.

To a reviewer, this poses a different problem—one journalists have been grappling with ever since candidate Trump came to national prominence. If the president (or presidential candidate) says crazy, provably false things and a journalist or reviewer labels them as such—knowing his supporters will argue otherwise—does this make the writing biased? What if the supporters argue that the writing *is* biased? What if this argument consists of statements that are provably false, entirely lacking in evidence, and either originated with or were repeated and spread by the president himself? This is an awkward, problematic situation, and it is the sort of thing the authors dissect, discuss, and analyze. That is why this is an important book.

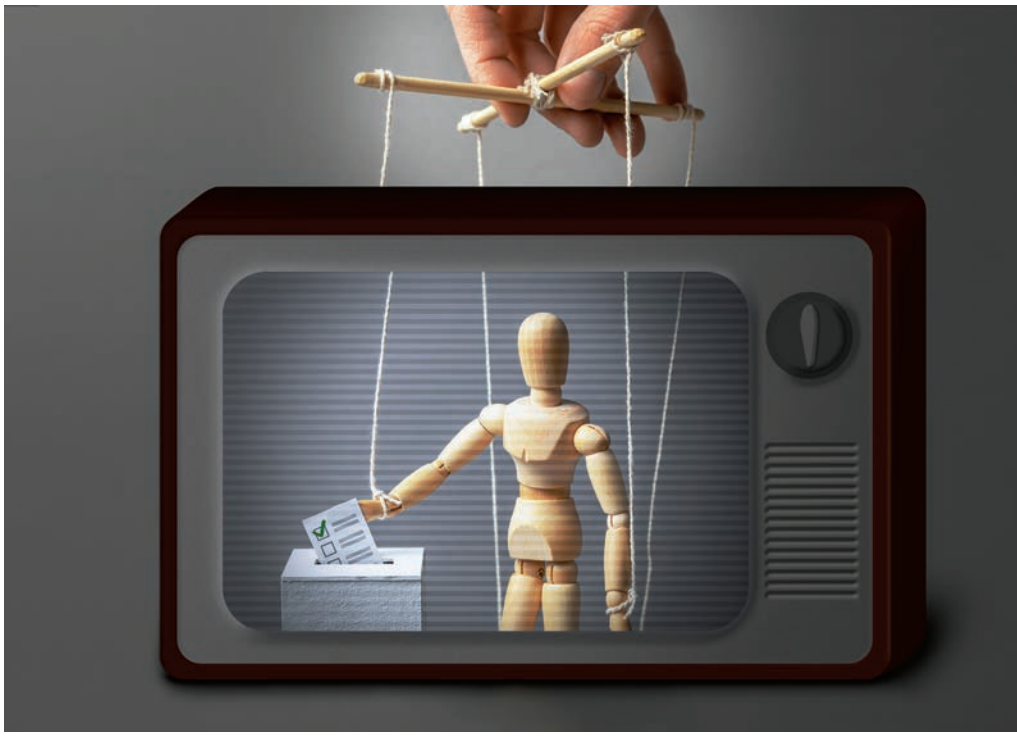
Its authors were featured prominently in the July 2020 *PBS Frontline* documentary *United States of Conspiracy*.

Their book gives one interesting insight or observation after another. Here are just a few samples of its important ideas.

Chapter Two, "It's True Enough," focuses on the way Trump and some others (Representative Bryan Zollinger is one named) periodically make strange assertions, and when asked if they really believe what they are saying reply along the lines of "it's true enough" (or, in Zollinger's case, "I am not saying it is true, but I am saying it is completely plausible"). The result, the authors say, are debates and, worse, policies based on "crippled epistemologies" where no one knows or even cares if a fact is true or not.

The authors point out that most traditional conspiracies are based on stringing together facts (or allegedly factual statements) in strange patterns using unorthodox connections to come to a new perception of reality, society, and politics—something dangerous in itself. But, they argue, if one is forming conspiracies without even trying to use facts and that people then accept them as factual, society and the government are on very shaky, very dangerous ground. Conspiratorial thinking and paranoid patterns of thought become normalized and commonplace once this happens on a regular basis.

Beginning with the premise that the concept of facts itself is being eroded within our government, the authors then move on (and it's quite an interesting trip) to the premise that faith in the government itself is being eroded in tangent with the erosion of facts. The very foundations of democracy are weakened. If facts are no longer necessary to form opinions and take action, not only does this mean that knowledge-producing institutions are no longer important or valuable, but it also brings into question how citizens can make good voting choices. If the traditional—admittedly idealized—process for voting was for citizens to study the issues and select the candidate with the best response to the issues, how will this happen if people don't care about the facts of the issues?



Debates and, worse, policies have become based on "crippled epistemologies" where no one knows or even cares if a fact is true or not.

While *A Lot of People Are Saying* predates the 2020 election, we as a nation are now grappling with a situation where a portion of the population still insists, without offering valid evidence, that the results of the election were not officially reported or measured. The authors describe how a culture of policy in the absence of facts and based on an extremely cynical view of the role of government institutions erodes not just political institutions but political parties themselves. The paranoid, random nature of action that stems from this style of thought and behavior erodes the ability to have faith in any long-term institution that uses it.

Read this important book. Bizarrely enough, the future of American democracy may depend on addressing the issues it discusses. Yes, facts are important—or at least they used to be. And, as the authors detail, national policies based on the premise that facts are not important are a dangerous and self-destructive thing. ■

Peter Huston, a former journalist and author of several books, has contributed to this publication since 1992. Three of his books are on skepticism and paranormal claims: *Scams from the Great Beyond*, *More Scams from the Great Beyond*, and, most recently, *Scams from the Great Beyond—The Presidential Edition*. Huston lived in Asia for six years and has two graduate degrees, one in Asian studies, the other in ESL Education. His MA thesis was on the history of paleontogy in China. He's currently researching Chinese pre-scientific concepts and wacky ninja claims in his spare time and lives in upstate New York. His website is www.HamchuckWC.com.

Unraveling *Unspoken*

Benjamin Radford

As a film fan, I have been delighted to be able to see film festivals even during the pandemic. It was in that capacity that a short documentary film titled *Unspoken* caught my eye. It's about Emma Zurcher-Long, a girl with autism. The film screened at the Slamdance Film Festival earlier this year.

Unspoken. 2017. Directed by Julia Ngeow, Geneva Peschka, and Emma Zurcher-Long. 26 Minutes. Disrupter Productions.

Executive produced by actress Vera Farmiga, the film is available at, and described on, Videoproject.com:

> 14-year-old Emma Zurcher-Long invites the viewer on her quest to enrich understanding of what it means to be human in this collaborative self-portrait that portrays her dynamic life as an autistic teenager. For years, Emma's intelligence was continually underestimated as she struggled to communicate her feelings, needs, and fears to her friends and family. But for the first time in her life, her true voice is finally heard when she begins typing, seeing, and hearing the world in "hi-res, Technicolor, and surround sound". Through her keyboard, Emma strengthens her connection with others, and her insightful writing is both a catalyst for, and a remedy to, the fear and misunderstanding that surrounds autism. Living in the beauty beyond spoken language, Emma is challenging the societal judgment surrounding autism, one keystroke at a time.

The film has many glowing reviews. Educational Media Reviews Online says it's "Recommended [and] provides a fascinating glimpse into a unique style of communication … Inspirational and enlightening." Rua Williams, in the *Canadian Journal of Disability Studies*, writes that "Emma and the entire *Unspoken* documentary team have committed themselves to activism in preservation of the human right to communication access." Another reviewer, Katie Flynn, goes even further: "*Unspoken* is, quite possibly, one of the most important short films of our time."

Curious to know more about Emma, I looked online and found plenty, including *Emma's Hope Book*,

> a blog written by Emma. Occasionally she invites her parents, Ariane Zurcher and Richard Long, to contribute. This blog began as a document of what her parents thought, but when Emma began typing to communicate in the fall of 2012, she proved all those previously held assumptions wrong. *Emma's Hope Book* is where Emma publishes her short stories, poems, insights, and opinions, particularly about autism. Emma wrote, "My mind talks heavy thoughts, but my mouth talks silliness." Emma writes by typing on a keyboard synced with her iPad and wishes people would "listen to my writing voice, but they listen to my talking voice instead."

At one point her mother says of Emma: "Here she was knowing how to read and write for many years but had no way of expressing it … When she started typing a year ago, it opened up all these minds."

These comments—though superficially inspirational—raised more red flags for me. I'd heard that same sentiment, and identical phrasing, in materials about facilitated communication (FC), and it wasn't the first time in an acclaimed documentary short film (see my piece "Academy Award-Nominated Film Promotes False Hopes" in the January/February 2005 SI).

In the 1980s and 1990s, many parents of autistic children turned to facilitated communication, which had been claimed to help autistic children communicate better. The idea behind FC is based on the premise that the lack of communication is not due to an underlying cognitive disorder but instead to motor disorders such as those affecting the ability to coordinate speech. What is needed, FC advocates claim, are trained facilitators to help the autistic children by holding their hands, fingers, or elbows while the child types on a keyboard or points to lists of letters, words, or symbols to communicate. In this way, the child can break through the tragic blockage of her disorder and speak, perhaps for the first time, to her parents and loved ones.

Yet the premise that communication problems in autistic patients came from speech motor dysfunction was unsupported by medical science. The messages that the autistic children were sending much more closely matched those of the facilitator than the child. The words, diction, nuances, and grammatical structures used in the messages

frequently far exceeded what an autistic child could have learned. This, however, rarely deterred FC proponents, who stubbornly took this troublesome evidence instead as proof that doctors were underestimating the autistic children's abilities—exactly as we see in Emma's case.

So it was with a sense of both unease and déjà vu that I watched *Unspoken*. In the film, we see that Emma is the author of many inspirational or poetic quotes (many of which appear onscreen, such as "Piercing shards of past and present pain cause me to turn away or make faces or laugh out loud to lessen the weightiness"). Allegedly all the narrative in the film was written by Emma as well (or at least adapted from her writing). However, in her everyday interaction, she does not seem to exhibit anything resembling that level of diction. She's also a singer and author of a book, and the film shows that Emma can clearly speak; she says several responsive and substantive comments in the film. She also clearly has good motor skills, which raises the question: Why is her mother holding a keyboard for her as she types?

It was with a sense of both unease and déjà vu that I watched *Unspoken*.

At some points Emma seems to be looking at the keyboard as she types, but at other times she doesn't. The clips seen of her typing in the film are not long enough (whether intentionally or otherwise) to see whether she's typing words or just a few letters at a time. There may well be better video available of her composing elsewhere, but if there isn't that's a red flag: Why *wouldn't* there be a ten or fifteen minute video of her typing out an eloquent message? If she can speak well enough to sing and communicate with her family—not to mention codirect this film—why can't she just dictate her messages to an assistant or even a voice-to-text program?

Given the carefully edited and presented footage, it wasn't completely clear how (or to what extent) Emma was independently communicating, but it raised a strong suspicion that some variation of FC was at work. Numerous studies over three decades have failed to validate the claims of FC. *Unspoken*, as well as others, including the 2017 film *Deej* (see Janyce Boynton's review in the January/February 2021 SI) may in fact document a miracle. Emma seems like a bright and lovely girl, and I sincerely wish her the best. But science and medical evidence suggest that FC is at play, and by leaving out information that casts doubt on the technique, these films may cruelly foster false hopes in friends and families of autistic children. ■

Benjamin Radford, MEd, is deputy editor of Skeptical Inquirer and author of many books on critical thinking and science literacy.

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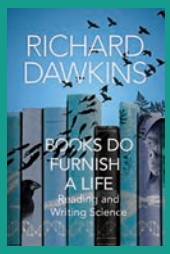
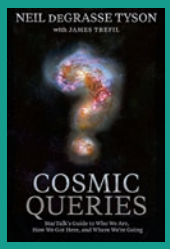
NEW AND NOTABLE]

Listing does not preclude future review.



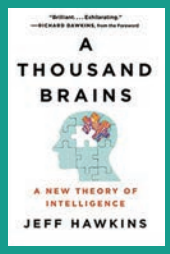
BOOKS DO FURNISH A LIFE: Reading and Writing Science. Richard Dawkins. Edited by Gillian Somerscales. A fine collection of short writings by Dawkins, the noted zoologist and master of science communication. All are in some way connected with books ("the love of books," Dawkins says) that have furnished his life in science. They include forewords, afterwords, introductions, reviews, and essays. An introduction, "The Literature of Science," celebrates science ("the poetry of reality") as a vehicle for great literature. Dawkins extolls such notable science-poets as Sir James Jeans, Carl Sagan, Carolyn Porco, Peter Atkins, Lawrence Krauss, Lewis Thomas, and Peter Medawar ("the greatest literary stylist among the scientists of the twentieth century"). The chapters are organized into six sections that pretty much sum up the vast range of Dawkins's interests: Writing Science, Celebrating Nature, Exploring Humanity, Supporting Scepticism, Interrogating Faith, and Evangelizing Evolution. The beautifully written book again shows why Dawkins might have included himself among great scientists who are equally at home in science and literature. (U.S. edition coming in September.) Bantam Press/Penguin Random House, 2021, 453 pp., £25.00.



COSMIC QUERIES: *StarTalk*'s Guide to Who We Are, How We Got Here, and Where We're Going. Neil deGrasse Tyson with James Trefil. Everyone's favorite astrophysicist Tyson and physics educator Trefil combine on a beautiful book on the deepest questions that come our way: What is our place in the universe? How do we know what we know? How did the universe get to be this way? How old is the universe? What is life? Are we alone? How did it all begin? How will it end? What does nothing have to do with everything? Going deeper than his popular *StarTalk* show can, Tyson notes that the book nevertheless uses the "informative but still breezy DNA of StarTalk itself." With spectacular color photos and artwork. National Geographic Partners, 2021, 309 pp., $30.00.

GOOD THINKING: Why Flawed Logic Puts Us All at Risk and How Critical Thinking Can Save the World. David Robert Grimes. Grimes (a UK physicist, science communicator, and John Maddox Award recipient) takes us on a lively ride into why we go so badly askew with our thinking and how to avoid the worst consequences. "The truly staggering events" (his description) of the past year have made the book even more timely and important. Topics includes formal fallacies and how to defeat them, spotting and debunking dubious rhetoric, the struggle between reason and belief, how numbers can mislead us, how media indulge in bad thinking, and what science is and what it is not. "This is not a textbook," says Grimes, "it's a collection of incredible stories delving into the missteps that underpinned them." The Experiment (New York), 2021, 385 pp., $15.95.

MYSTERIES & SECRETS REVEALED: From Oracles at Delphi to Spiritualism in America. Loren Pankratz, PhD. Pankratz, a retired psychiatry professor and CSI fellow, takes us on a wide-ranging journey focusing on courageous people throughout history "who asked uncomfortable questions." They all "experienced an unconquerable desire to uncover reliable information … no matter the consequences." He starts with the ancient Greeks and "the doubting of oracles" and then the leading figures of the Italian Renaissance. Probably most interesting for SI readers is a series of core chapters on investigations of the "poster boy for clairvoyants" Alexis Didier, claims of remote travel, the work of French conjuror Jean-Eugene Robert-Houdin, mesmerism, modern hypnosis, spiritualism, the Turing test, Faraday's investigations of table turning, tests of Eusapia Palladino, and slate writing. Heavily researched and documented, with many sources from the author's own extensive collections. Prometheus Books/Rowman & Littlefield, 2021, 456 pp., $29.95.



A THOUSAND BRAINS: A New Theory of Intelligence. Jeff Hawkins. Foreword by Richard Dawkins. Silicon Valley neuroscientist Hawkins, who talked about this book in an April Skeptical Inquirer Presents online talk, here describes extraordinary new (starting in 2016) findings about how the brain works—one of life's most fundamental mysteries. It involves the brain's making maps and reference frames and multiple models of the world, hundreds of thousands of them. Most of the cells in your neocortex are dedicated to creating and manipulating these reference frames, one in each of many neatly stacked columns, which the brain uses to plan and think. With this new insight, some of neuroscience's biggest questions start to come into view, says Hawkins. "Don't read this book at bedtime," Richard Dawkins writes in his introduction. "It won't give you nightmares. But it is so exhilarating, so stimulating, it'll turn your mind into a whirling maelstrom of excitingly provocative ideas." Basic Books, 2021, 272 pp., $30.00.

THREATS: Intimidation and Its Discontents. David P. Barash. Barash, a noted evolutionary biologist and professor emeritus of psychology at the University of Washington, examines the nature of threats. Divided into three sections (The Natural World, Individuals and Society, and International Affairs), his book explores the dynamics of threat and counter-threat, including the fear of death, Hell, and strangers. The whole book is insightful, though the sections of most interest to skeptics involve inflated and exaggerated threats, including Stranger Danger: "Fearing leads to threatening, and threats, in turn (whether real or imagined), lead to greater fear, resulting in a closely coupled system of reciprocal stimulation" (89). This has broad implications for society, ranging from gun violence (two-thirds of gun owners are motivated by fear of violent crime, despite a steep decline in violence) to police misconduct and nuclear deterrence. Oxford University Press, 2020, 248 pp., $18.21.

—Kendrick Frazier and Benjamin Radford

Fighting Creationism

Great anti-creationist articles from Nathan Lents and Richard Dawkins, but both are preaching to their choirs (Lents, "Behe, Bias, and Bears, Oh My!"; Dawkins, "Science: The Gold Standard for Truth," both March/April 2021). Time is of the essence. This is spiritual warfare. Offense is needed, not defense. Fight on their turf. Jesus was a creationist because his death was to fix what Adam and Eve broke. Adam and Eve were real humans, created, not born, from whom all humans descend.

If this is not factually true, their religion is just another myth-based false way. For your information, this means all liberal non-creationist versions of Christianity are heretical, period! Creationism is a required tenet of this faith. This explains America's great divide.

The creationists saw Trump as telling the truth, and they *hate* liberal Christian hypocrites. Expose the absurdities inside both of their belief sets, the right and left. Here's a useful verse: Proverbs 12:17, "He who speaks the truth gives honest evidence, but a false witness utters deceit." Somebody should have quoted that to Trump. Also, Psalms 119:128, "I hate every false way."

[Name and address withheld by request]

Clearly Richard Dawkins has great ability to find truth and communicate science. As eminent a skeptic and scientist as he is, this article highlights how smart people might be clueless about fields unrelated to their expertise.

It is puzzling to me that in an article about truth Dawkins gets into politics. To equate the Trump White House to Orwell's "Ministry of Truth" is ridiculous! It is a fact that the FBI lied to spy on Trump. It is a fact that the Russian collusion narrative was invented to cover up the Hilary Clinton email scandal.

If Dawkins wants to get into political commentary, he would do better, considering his influence, to look at the big picture. The cancel culture, media bias, and big tech censorship are important issues regarding truth that should concern everyone. Reread Orwell and think about what is going on today.

Steven Van Jepmond
Menlo Park, California

Arguing for Evolution

In his essay "Facts, Theories, and Best Explanations" (March/April 2021), Peter Marston does his best to side-step the problems evolutionists have when confronting people with other, usually theologically grounded, points of view. His main point is that when creationists reject standard biological models by claiming that evolution is "merely a theory" biologists are ill-advised to retort with "No, evolution is a fact." His preferred avenue for further discussion (when such is possible) is to argue that evolution is "the best explanation" for the diversity of life on the planet.

I'm not sure I can agree with him, for two reasons. First, creationists *already* think they have the "best explanation," so asserting that they don't is unlikely to be effective. Second, evolution *is* a fact—but making that simple claim, as he noted, is typically not productive. What is needed is an addendum: "And, as with many facts in science, there are different theories of it."

If the dialogue continues, point out that Darwinism is one; saltationist models another; then there are Lamarckism and epigenesis. Combinations of these theoretical frameworks make up the modern but still evolving consensus in biology about the fact of evolution.

Arthur S. Reber, PhD
Point Roberts, Washington

Peter Marston's advice to interpret evolution in terms of "best fit" is an invitation to disaster for purposes of communicating with persons steeped in a creationist worldview. People are not going to skew their whole framework of reference to fit a bunch of physical facts. Evolution is clearly not the best fit with what people perceive as their spiritual development, their emotional relationships, and their belief in the purpose of their own lives.

As a firm adherent to an evolutionary view of life on earth, I realize the painful sacrifices in other aspects of our personal lives this view demands. Look at the obituary columns in any urban newspaper to see that the deceased has "returned to our Father's home," is "in the arms of the Beloved Creator," has "reunited with his wife of 55 years." Is evolution the "best fit" with that worldview? If not, forget trying to impress it upon that mindset. "Return to our chemical elements" is a bleak thing to offer in the face of death. Evolution does not inspire faith in the kind of human prospects that inspire noble deeds.

We require perhaps a century of interpretation by poets such as Loren Eiseley, by musicians who invent new forms of celebration, by artists who envision a new panoply of time. It isn't a matter of "best fit" with the known facts but best fit with our sense of ourselves, our hopes for human life, and the destiny of our souls.

Sharon Scholl
Atlantic Beach, Florida

Why don't we start calling evolution a law, as we call Newton's law of gravity? Technically, it may not be strictly accurate, but our audience, who can't tell the difference between the common and scientific usage of the word *theory*, won't notice.

Richard Uschold
Port Orange, Florida

Disagreeing about QAnon

In the article "Life, the Quniverse, and Everything, Part I" (March/April 2021), Stephanie Kemmerer states, "A careful reading of LaVey's *The Satanic Bible* shows it is nothing more than a misinterpretation of the made-up text *Enochian Aethyrs*, with certain 'angelic' words changed to 'demonic' ones."

Nothing could be further from the truth. First, the Enochian Calls are only a small part of *The Satanic Bible* and probably the least important part. Ritual magic is something the individual Satanists may choose to either explore or ignore at their discretion. Satanism is about the individual, after all. Second, the official Church of Satan website documents LaVey's process writing *The Satanic Bible* and his justification for including the Enochian Calls. LaVey was quite familiar with John Dee and the *Liber Loagaeth*; he did not "misinterpret" the made-up language of Enochian. LaVey purposefully altered the Keys for his own purposes. This information is all easily and publicly available.

J.D. Sword
via email

QAnon is no more to blame for damaging people's lives than guns are responsible for murder. In both cases, it is the person who, as even author Stephanie Kemmerer acknowledges, "already [has] a mental or emotional in-

stability." QAnon is a salve for the pain, just like alcohol or drugs, and it is just as misleading and almost as damaging.

Moreover, although I am not a woke, Red pill ingester, I believe in the reality of the Deep State. Among its many members is the collection of bureaucrats who endure no matter which party controls the White House or Congress and who, like all human beings, resent being pushed in a direction different from the one they have been facing for as long as they have been in service. An iconoclast such as former President Trump, who tried to make them "face in a different direction" was bound to meet "resistance."

And if Kemmerer wants to assert that Trump is chiefly responsible for the divisiveness over the past four years, I urge her to subject her conclusion to the kind of scrutiny that one should be able to expect from a contributor to Skeptical Inquirer. I contend that he was only responding to the avalanche of vitriol directed at him from all sides. Their motivation? See above, but add thwarted, moneyed interests to the rigid bureaucracy mentioned.

David Seltzer
Long Beach, New York

Stephanie Kemmerer lost me in her QAnon article when she made the absurd statement that Trump used "neofascist politics." Obviously, she has no idea what the term *fascist* means and uses it as a common pejorative instead.

Trump was anything but a fascist, especially as he cut regulations on the economy. After that statement, I had to question the veracity of the rest of her information … not that I would believe anything I have seen about QAnon elsewhere either.

No, I am not a rally-attending, red-hat-wearing Trump apostle. In 2020, I did vote for him because he proved himself on the economy and foreign affairs, his tweets and claims on other topics aside.

If I want politics, I will read political magazines. In the case of SI, I am expecting science and science alone.

David Kveragas
Newton Township, Pennsylvania

Havana Syndrome

In his article "NAS Report on Havana Syndrome Mired in Controversy" (March/April 2021), Robert Bartholomew lays bare some of the ridiculous theories regarding the so-called Havana Syndrome, which is best explained as an example of mass hysteria. Unfortunately, much time and media space—as well as big medical dollars—are wasted investigating other vague syndromes with inconsistent symptoms and medical findings. The most recent such syndrome representing probable mass hysteria is "long Covid" in adults and children. Billions are being spent on this "syndrome." Results will predictably be noninformative. Another recent syndrome that appears to have disappeared from view but in its day spawned millions of cases was "chronic fatigue syndrome," also best explained as an example of mass hysteria. To quote the philosopher Santayana, "Those who fail to remember the past are condemned to repeat it."

Alan Lubin, MD
Gates Mills, Ohio

Batteries and 'Hauntings'

Benjamin Radford's "Do Blinky Batteries Prove Ghosts" (January/February 2021) was interesting, but I can't help but wonder if the experiment could have been done differently. Instead of placing batteries in "haunted" and "not haunted" locations and checking their drainage, perhaps he could have put new batteries in devices (cameras/flashlights) and then actively used these devices in "haunted" and "not haunted" locations before measuring their drainage. I suggest this because in every account of batteries dying during ghost investigations that I've read, the batteries were in devices being used, not batteries sitting on a shelf. I'm not questioning; I'm just curious.

Jennifer Osborne
Lester, Pennsylvania

Benjamin Radford replies:

Osborne is right, and I appreciate the comment. Had this been a full-fledged scientific experiment, I'd likely have done that. As I noted in the column, "Had there been an effect, I'd have had reason to replicate the experiment with a much larger sample, stronger controls, monitoring to prevent fraud, etc." This would include having the batteries in use, though presumably ghosts can drain energy from batteries whether they're actively in use or not. This was a small informal experiment conducted in the context of a television show, and the producers were less interested in doing valid science than in creating dramatic TV. In fact, my investigations at that location were edited out of the final broadcast! I welcome anyone replicating the experiment with batteries in devices being used and would be happy to help with research design.

Erratum: Asteroid Names

In our May/June 2021 issue, a sentence on page 10 said the great experimental physicist C.S. Wu, "was the first living scientist to have an asteroid named after her (in 1990)." Although that statement appeared in the extensive Wikipedia entry about Wu, citing a 2007 biography, it is incorrect. Starting in the 1970s, many living scientists (most but not all of them associated with planetary studies, such as astronomer Tom Gehrels of the University of Arizona) have had asteroids named after them. Among those so honored before 1990, ironically, are at least three SI contributors, Alan Harris, David Morrison, and Clark Chapman. All are, happily, alive and still contributing to our understanding of the world. (We also arranged to have Susan Gerbic's GSoW team fix the erroneous Wikipedia mention.)

[FEEDBACK

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words.** Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@skepticalinquirer.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

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then Silicon Valley), analyst of climate-
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Universite of Nice
Faculte Des Sciences
Parc Valrose, 06108
Nice Cedex 2, France
+33-489.15.02.28 (only on Wed. p.m.)
Henri Broch
Henri.Broch@unice.fr

CFI Kenya
Center For Inquiry–Kenya
United Youth Group House, Wing B
Makadara, Jogoo Road
Kenya
George Ongere
geongere@yahoo.com

CFI Peru
Calle El Corregidor 318
Urb. El Manzano, Rimac
Lima 25-PERU
Manuel Paz y Mino
mapymc@yahoo.com

CFI Poland
01-876 Warszawa
Ul. Broniewskiego 99/147
Poland
Andrzej Dominczak
dominiczak@wp.pl

CFI Spain
Madrid, Spain
Luis Alfonso Gamez
lgamez@terra.es

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Galaxies in Glorious and Splendid Variety

This spectacular image taken with the NASA/ESA Hubble Space Telescope and posted by NASA on May 21, 2021, showcases the galaxy cluster ACO S 295, as well as a jostling crowd of background galaxies and foreground stars. Galaxies of all shapes and sizes populate this image, ranging from stately spirals to fuzzy ellipticals. This galactic menagerie boasts a range of orientations and sizes, with spiral galaxies such as the one at the center of this image appearing almost face on, and some edge-on spiral galaxies visible only as thin slivers of light. The galaxy cluster dominates the center of this image. The cluster's huge mass has gravitationally lensed the light from background galaxies, distorting and smearing their shapes and producing a visually striking scene.

IMAGE CREDIT: ESA/HUBBLE & NASA, F. PACAUD, D. COE